

MILL SECTION of Concrete

The Mill Edition of CONCRETE is edited for the manufacturers of portland cement, lime and similar products. Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition.

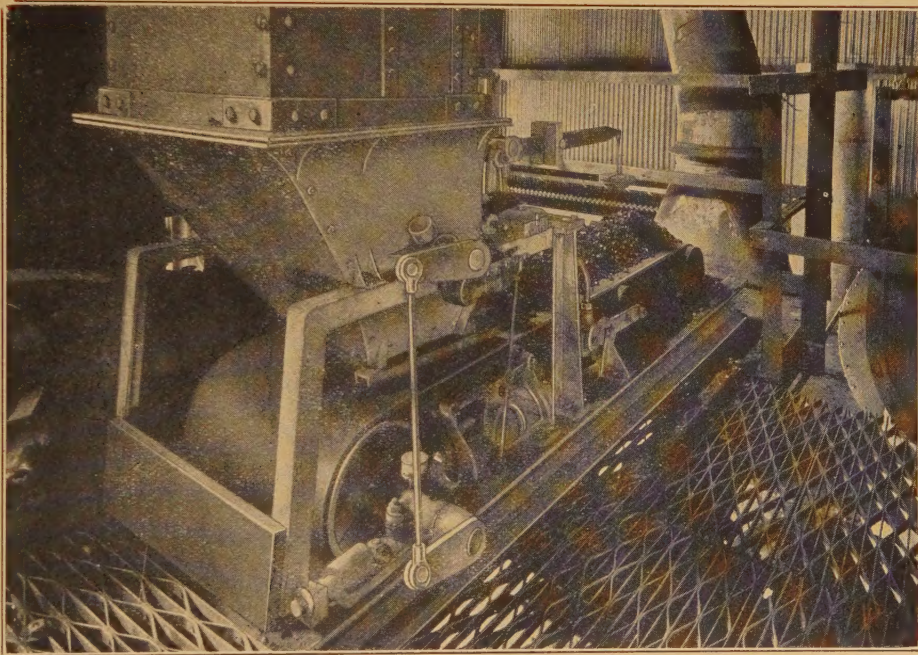
The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

Volume 30

April, 1927

Number 4

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Photograph showing a Poidometer weighing and feeding crushed coal to a dryer at the Nazareth, Pa., plant of the Nazareth Cement Company

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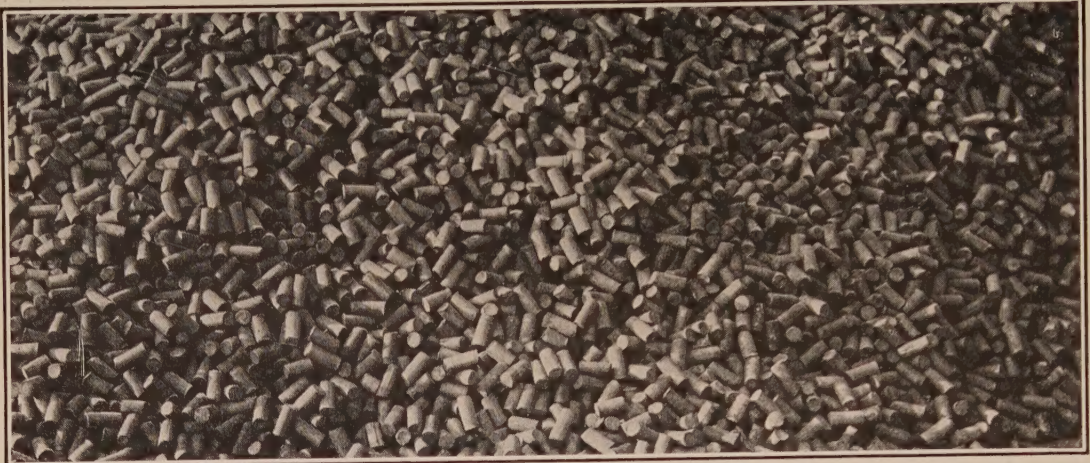
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1926 Safety Record in Cement Mills

An Account of the Progress Made in Accident Prevention in the Cement Industry and Some Reasons for That Progress

THE process of manufacturing cement is accompanied by numerous perils. The hazards of the quarrying industry with blasting; those of switching and other plant railway operations in which are handled heavy raw and finished materials, dangerous to load and to unload; of kiln operation and the preparation and use of powdered coal and hot clinker, and of the handling in bins of materials which flow dangerously, all combine to make safe operation a difficult matter.

In view of the inherent hazards of the industry, therefore, recent marked progress in the reduction of accidents in cement plants is as refreshing as it is remarkable. Moreover, it reflects great credit on management and workers alike and presents a very fine example of what can be accomplished through good organization and team work.

Successful safety records have behind them a great deal less of the element of luck and more hard work than is generally conceded to them.

The perfect scores made by the two plants which won the Portland Cement Association's trophies for 1926 were the direct result of intense organization along four lines:

1. Painstaking selection, care and protection of machinery, tools and other equipment.
2. Careful examination of employees in order to guard against the presence in the plants of workmen possessed of hazardous disabilities or careless habits—Plant doctors and dispensaries.
3. Constant education of workers as to serious personal consequences of accidents, safe and unsafe practices and means of rendering first aid.
4. An endeavor to fix the responsibility for every accident, impressing the foreman particularly, with the desirability of carefully investigating and studying every accident.

1926 Winners Are Safety Veterans

Mitchell, (Indiana) plant No. 2 of the Lehigh Portland Cement Company and plant No. 13 of the Canada Cement Company, located at Fort Whyte (Winnipeg) Manitoba, were recently announced as joint winners of the Portland Cement Association safety trophy contest for 1926. Neither had a lost time accident during the entire year. The Mitchell mill had operated 404 days without an accident of any kind. The Winnipeg mill previous to making its perfect safety score during 1926, had completed its entire operating season of 1925 without accident, but failed to win the trophy in 1925 owing to a provision in the rules which requires at least 6 months' operation to qualify.

Superintendents W. H. Weitknecht, of the Mitchell mill and J. R. Dowrie, of the Winnipeg mill, with their entire safety committees and staff of workmen have been warmly and deservedly congratulated. In commenting on the excellent scores, cement officials also place much of the success of these organizations on Major H. A. Reninger, of the Lehigh, and Assistant General Manager Tagge of the Canada Company, who are recognized as veteran safety drill-masters in the industry.

Accident Figures Compared

The following figures on plant safety in the cement industry compose a very interesting record of recent attainment. In October, 1925, 43 plants operated without a lost time accident, while in October, 1926, 60 plants were similarly successful. During the same month in 1925, 83 plants out of 126 reporting had 253 accidents and in 1926, 69 plants out of 129 reporting had 143 accidents.

In November, 1925, 53 plants operated without lost time accident, while in November, 1926, 75 plants operated with clear records. Seventy-three plants reported 208 lost time accidents in November, 1925, while 54 plants with a total of 113 accidents represents the record for November, 1926.

At the conclusion of the Portland Cement Association's recent safety contest extending over the last quarter of 1926, it was found that fifteen mills operated during the entire three months without a single day's loss of time. The total number of accidents occurring in this period was 410, as against 625 for the corresponding period a year before. The entire record for October, November and December of 1926, as compared with the same months of 1925 shows a reduction of 10 fatalities, 3 permanent disabilities and 215 lost time accidents. In addition to the fifteen mills which operated entirely without loss of time, 22 others suffered only one accident and fifteen more suffered only two accidents.

Fatal Accidents Take Sharp Decline

Fatal accidents are, of course, the most distressing with which the industry has to deal. Until recently, fatal accidents have successfully defied all efforts aimed at their reduction and the feeling began to gain headway that perhaps a certain number of workers were foredoomed. However, the 1926 record of fatalities due to accidental causes shows a decided decrease, due to better records in almost all departments of quarry and plant operation. The number of fatal accidents suffered by month and by department during 1925 and 1926 are shown in the following tables:

FATAL ACCIDENTS BY MONTH			FATAL ACCIDENTS BY DEPARTMENTS		
Months	1925	1926	Departments	1925	1926
January	4	1	Quarry	14	7
February	6	1	Crushing	5	6
March	6	4	Coal Grinding	11	7
April	8	5	Raw	4	6
May	4	3	Burning	6	10
June	5	6	Finishing	6	3
July	3	4	Cement Storage	1	1
August	3	6	Packing and Shipping	—	1
September	1	4	Power	—	—
October	8	4	Shops	4	2
November	5	6	Store Room	—	—
December	8	3	Railroad	4	—
	—	—	Yard	5	4
Total	61	47	Offices-Laboratory	—	—
			Other Than Above	1	—
			Total	61	47

Good Organization Necessary

The historian tells us that the Alps were not crossed in a day; neither can an unorganized plant on first attempt equal the record of the organization which has advanced methodically to perfection. One of the most conspicuous examples is that of the Canada Cement Company's mill No. 8 at Port Colbourne, Ontario, which recently reported 521 days of continuous operation without a single lost time accident. It operated a total of 700 consecutive days with only 18 hours time lost. It took several years of intense effort, however, to work up to this stage of efficiency. The facts as to this remarkable record have been fully authenticated by the provincial department of labor and industry, the physicians of Port Colbourne and the plant safety committee.

Many other records made in various departments of cement mill operation show results in organized accident prevention work almost beyond the ordinary conception of what it is possible to attain. The electrical gang at the plant of the Lehigh Portland Cement Company at Union Bridge, Md., has operated well over 2000 days without a single lost time accident. All of the departments of the mill proper, at the plant of the Pennsylvania-Dixie Cement Corporation at Richard City, Tenn., had operated 1028 days without lost time accident at last report.

One may consider the remarkable quarry record of the Louisville Cement Company almost in the light of an exception which proves the rule. In this company's quarry

at Speed, Indiana, not a man has been injured by explosion in 25 years. But whatever the attention paid to the avoidance of accidents during the early years of this period, the company for several years past has not only conducted a continuous campaign of safety education among its workers but it has extended this work throughout the community, until personal safety is a common subject of discussion in the schools and in the homes of its employes. It issues a magazine featuring safety and its quarry is provided with armored steel shelters for the protection of the men against flying rock.

Safety work in the cement industry has progressed far enough to prove that a safe plant is a careful plant. A careful plant is an economical plant, one capable of supporting its workers in contented security and at the same time earning a reasonable return on its invested capital.

The personal hazards of war and those of industry are compared occasionally although they never should be. War is a business of destruction, the objects of which are generally to destroy, maim and kill. The participant who is spared is fortunate and his escape often marvelous. However, organized industry, such as that for the manufacture of cement, exists for the purpose of conferring benefits on humanity—and, of course, first among those benefited should come the workers upon whom industrial operations so largely depend. Personal injury to any of its dependents opposes the objects of the cement industry, offends the spirit of fair play and violates one of the prime fundamentals of good business.

Construction of New Valley Forge Plant Progresses

Some of the Equipment to Be Used

General grading at the site of the new Valley Forge Cement Company's plant at West Conshohocken, Pa., was started the first week of January, 1927, and soon after excavation was commenced on the main buildings and machinery foundations.

The first unit of the plant will be of approximately 2300 barrels per day capacity and equipment for the first unit will consist of the following:

One 48x60-inch jaw crusher for primary crushing, and a No. 9 hammer mill for secondary crushing. Clinker and rock storage will be 242 ft. in length and 30 ft. wide. A 15-ton traveling crane will be installed with a 3-yard bucket.

Compartment mills of the solo type 7 ft. 3 in. in diameter by 42 ft. 8 in. long, will be installed in both the wet and dry departments. The slurry will be handled from the wet mills by centrifugal pumps and from the finishing mills by the Fuller-Kinyon system.

Two 9-ft. kilns with 11 ft. 10 in. burning zones and 223 ft. long will be installed. These kilns are of the Polysius Solo type and will be constructed by the Polysius Corporation of Bethlehem, Pa.

Clinker from each kiln will be discharged into automatic scales discharging directly into the clinker storage.

The coal mill equipment consists of a 5 ft. 6 in. x 42 ft. Fuller-Lehigh indirect fired dryer and two 48-in. screen type Fuller-Lehigh pulverizer mills. The coal will be transported to the kiln bins by a Fuller-Kinyon system. Bailey type coal feeders will be used which will record the weight of coal fired. This, together with the clinker scales and the scales on the raw material, will give the operators a continuous record of material being handled.

Chemical Industries Exposition Planned

At the meeting of the Advisory Committee of the Chemical Industries Exposition, held at the Chemists' Club, 52 E. 41st St., New York City, Thursday evening, February 10th, with Dr. Arthur D. Little of Boston presiding, numerous details of the coming exposition to be held at the Grand Central Palace, September 26th to October 1st, inclusive, were planned and discussed at length.

Charles F. Roth, co-manager of the Exposition, reported very excellent progress with the Exposition to the Committee and that three floors of the Grand Central Palace had already been reserved.

The Students' Course, which will be conducted during the week of the exposition, is divided into two groups, the first or elementary group, and the second or advanced group.

Prominent among the features will be the various geographical exhibits divided as follows: The Southern Section by States and railroads to show the raw materials and opportunities of the Southern States; The Canadian Section by Provinces and railroads to show the raw materials of Canada suitable for industrial development. The Container Section, exhibiting containers used in industry with the machinery for packaging, bottling, and labeling; and a Laboratory Supply and Equipment Section. The sectional exhibits will be supplemented by displays of chemical products, machinery used in manufacture and development, dyes and fine chemicals, as well as instruments of precision, unit processes developed and in operation.

Many new features are being planned for this coming Exposition. One of interest is the change in policy which will admit exhibits of foreign manufacture for showing in the Exposition. This change has been made because the American Chemical Industries are now in such a position that exhibits of foreign products would prove stimulating.

Power Plant and Kiln Design and Operation

A Series of Articles on the Combined Processes of Power Plant and Kiln Operation Considered as a Unit

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Chemical Engineer

AND

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Electrical Engineer, Southwestern Portland Cement Company, Osborn, Ohio

Chapter VII—Thermal Losses in Kilns

Thermal Losses Due to Water—Effect of Water on Fuel Ratio—Heat Absorbed by Water in Kilns—Heat Available for Recovery—Fuel Required for Evaporating Water—The Kiln as a Dryer—How to Reduce Exit Gas Temperatures—Dewatering the Slurry

HIGH thermal efficiency can only be obtained by eliminating the various means whereby heat is absorbed or removed from the kiln without doing useful work. Heat so absorbed, or lost, represents a certain portion of the fuel which must be purchased, dried, and pulverized, but which renders no return on the money expended. It is obviously impossible to eliminate all waste of fuel, but a detailed study of the various avenues of heat waste will reveal many points at which fuel savings may be applied.

The moisture which is introduced into the kiln absorbs and carries away a very considerable portion of the heat liberated in the combustion of the fuel. The heat so absorbed and removed plays no useful part in the burning process and may be considered as a very promising field for improvements in thermal efficiency.

Means of Introducing Water

Water is introduced into the kiln in several ways which affect the heat absorbed. In a wet process kiln, the greater portion of the water will be admitted with the slurry. Even in the dry process, some entrained and combined water is present in the raw materials. A small amount will enter with the coal and some will be formed by the combustion of the hydrogen in the fuel. Moisture from these sources must be heated to 212 deg. F., latent heat added, and the resulting vapor heated to the gas temperature.

A certain amount of water vapor will be admitted with the air for combustion. This water will not require the latent heat but will absorb the necessary heat for raising the vapor to the gas temperature.

Effect of Water on the Fuel Ratio

In the preceding chapter it was shown that the ratio of the fuel burned to the mix fed, controls the percentage of carbon dioxide in the dry kiln exit gases. It was also shown that as the fuel ratio increases, the percentage of carbon dioxide approaches that due to the combustion of the fuel alone. The causes for such variations in the ratio were not traced. One of these causes of variation in the fuel ratio lies in the moisture content of the slurry. As the percentage of water is gradually raised from a dry mix

to that of the slurry in a wet mix, the heat necessary to evaporate the water and raise the temperature of the vapor will increase in proportion to the weight of water introduced.

Thus, to compare the fuel efficiency of wet and dry process kilns, it will be necessary to deduct the amount of heat required to evaporate the water and raise the vapor to the exit gas temperature from the total heat supplied to the wet process kiln.

Heat Absorbed by Water in the Kiln

Exit gas temperatures of rotary kilns will vary from 600 deg. F. in very long kilns with special heat transfer equipment to 1600 deg. F. for short dry process kilns forced beyond their efficient capacity.

Chart No. 1 shows the heat absorbed by one pound of water with various temperatures of the exit gases. A base temperature of 80 deg. F. has been assumed at which temperature the water is introduced into the kiln.

The heat absorbed by the water in passing from any starting temperature to any discharge temperature will be expressed by the formula:

$$H = (212 - t_1) + 970 + [.42 + .000103 (t_2 - 212)] (t_2 - 212)$$

Thus for entrance temperatures of 80 deg. F. and exit temperature of 600 deg. F. we have by substitution:

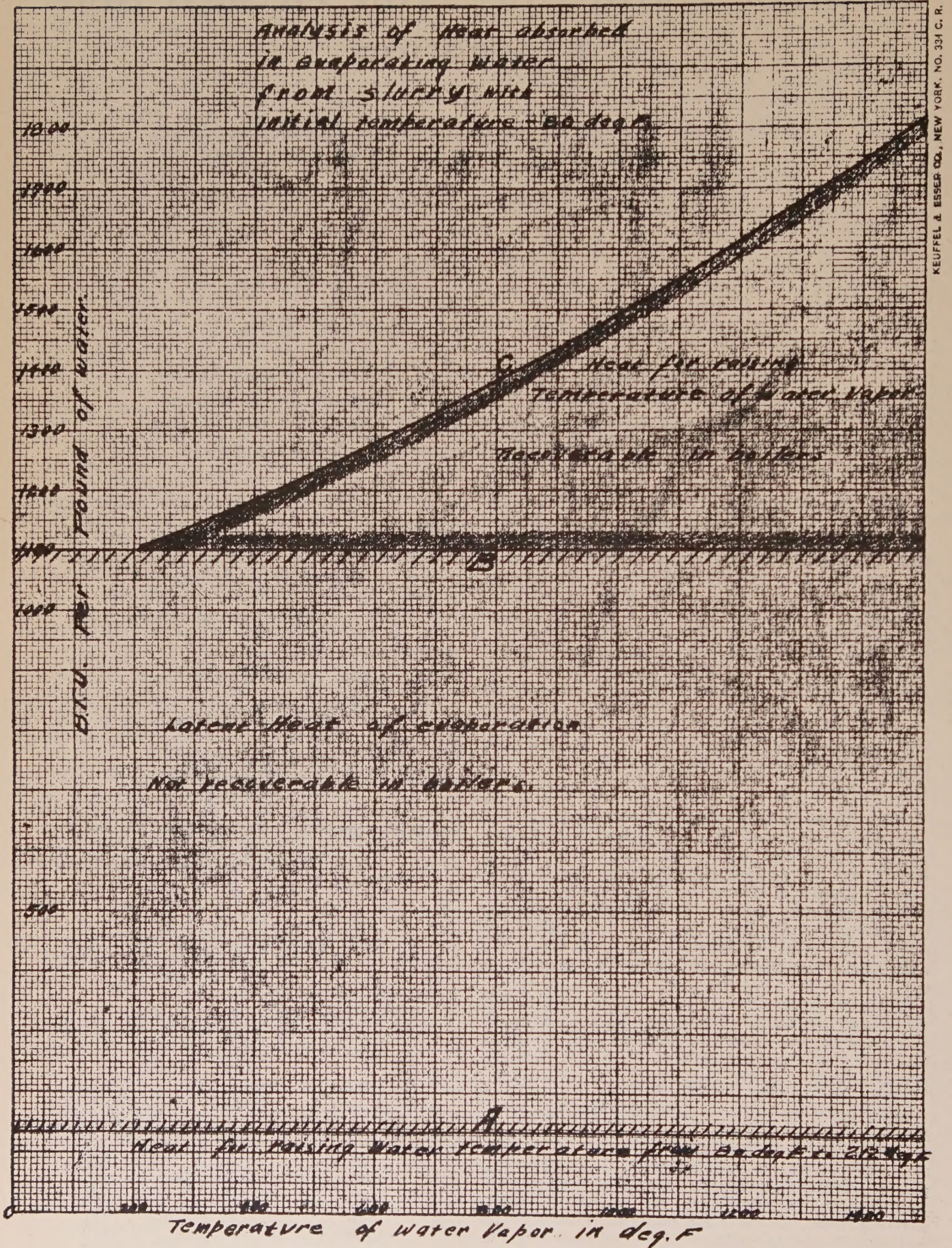
$$H = (212 - 80) + 970 + [.42 + .000103 (600 - 212)] (600 - 212)$$

$$= 132 + 970 + (.42 + .000103 \times 388) 388$$

$$= 132 + 970 + 178 = 1280 \text{ B.t.u. per pound of water.}$$

Using the same values for t_1 and various values for t_2 we have:

t_2 = Exit Gas Temperature in Degrees F.	H = Heat Absorbed in One Pound of Water B.t.u.
400	1185
600	1280
800	1385
1000	1497
1200	1618
1400	1746



KEUFFEL & ESSER CO., NEW YORK, NO. 334 C. R.

Chart No. 1

Should the initial temperature vary from 80 deg. F., correction may be applied by adding or subtracting from the first component in the above formula. This will have the effect of raising or lowering line A in chart No. 1, with the effect of adding a corresponding increase or decrease to lines B and C. Thus, starting with an initial temperature of 80 deg. F. we have for the first component of the formula $212 - 80 = 132$. If the slurry fed has some other temperature as 65 deg. F. then this component would be $212 - 65 = 147$. The correction to be applied will then be $147 - 132 = 15$. Thus 15 B.t.u. should be added to the values displacing lines A, B, and C by that amount. Conversely, if the initial temperature is as high as 100 deg. F. the value will become $212 - 100 = 112$ and the correction would be $112 - 132 = -20$. Thus 20 B.t.u. should be deducted from each line displacing the lines downward.

Heat Available for Recovery

A comparatively small portion of the heat absorbed is available for recovery in useful form. Referring to Chart No. 1, line A represents the heat absorbed in raising the temperature of the water from 80 deg. F. to 212 deg. F. The amount of this heat is not affected by the temperature of the exit gases and none of this heat may be recovered unless the temperature of the vapor is reduced below 212 deg. F., with consequent condensation of the vapor.

The distance A — B is a constant quantity and represents the latent heat of evaporation. This portion of the heat cannot be recovered except by the condensation of

the vapor in the gases by reducing the temperature below 212 deg. F.

Assuming conditions as shown on Chart No. 1 with kiln exit temperatures of 1200 deg. F. and economized exit temperature of 375 deg. F., the heat absorbed will be as follows, for one pound of water:

	B.t.u.
Heating for raising water from 80 deg. F. to 212 deg. F.	132
Latent heat of evaporation	970
Heat for raising vapor from 212 deg. F. to 1200 deg. F.	516
Total heat in vapor from 80 deg. F.	1618
Total heat in vapor from 80 deg. to 375 deg. F.	1175

Heat which is available for recovery in useful form. 443

Thus 27.4 per cent of the heat absorbed by the water vapor in the kiln is available for recovery in the waste heat boiler. It is true that with long kilns and special arrangements for more complete heat transfer, the exit temperatures may be reduced, thus decreasing the total heat required. If we could obtain perfect heat transfer with exit gases at 212 deg. F., we would still require 1100 B.t.u. for evaporating each pound of water.

Fuel Required for Evaporating Water

To be of practical value in visualizing the actual fuel

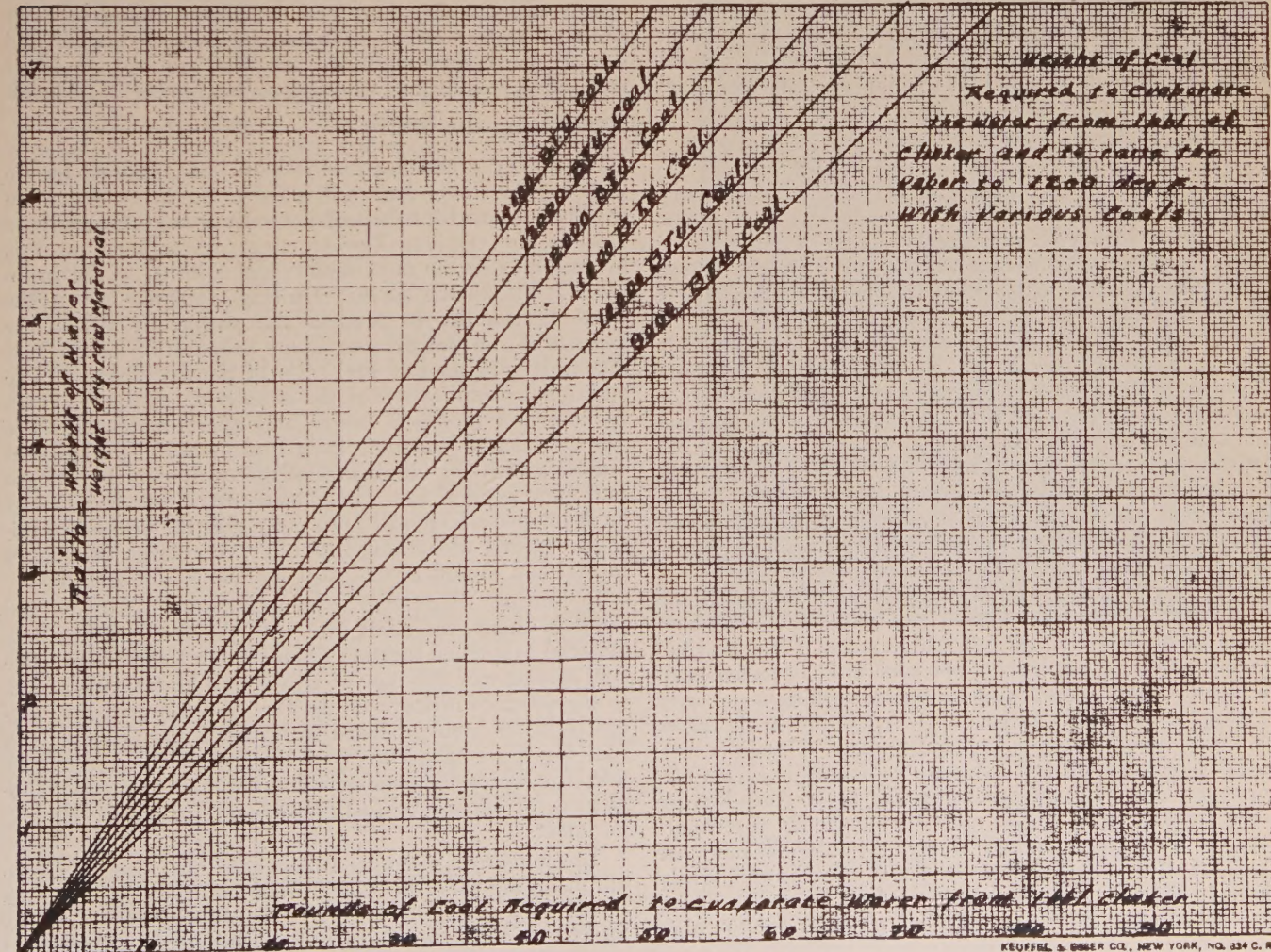


Chart No. 2

required by the moisture in the kilns, the heat required must be converted to pounds of fuel burned. Assuming 1200 deg. F. as an average for the exit gases, it is found that one pound of water evaporated and removed from the kiln at that temperature will carry with it 1618 B.t.u. which has been absorbed in the kiln. If the fuel burned has an actual heating value of 13,000 B.t.u. per pound then there will be required $1618/13,000 = .1244$ pounds of coal per pound of water. If the slurry contains 200 pounds of water per barrel of raw material fed to the kiln, there will be required $200 \times .1244 = 24.88$ pounds of coal per barrel of clinker for the evaporation of the water. Assuming that 115 pounds of this coal are required per barrel of clinker produced, then $115 - 24.88 = 90.12$ pounds of fuel are required for the clinkering of the dewatered mix. If the fuel contained 11,000 B.t.u. per pound, each pound of water will require $1618/11,000 = .147$ pounds of fuel and 200 pounds of water will require $200 \times .147 = 29.4$ pounds of fuel.

Chart No. 2 has been prepared to show the amount of fuel required to evaporate the water with one barrel of clinker under varying percentages of water in the slurry and with different coals.

It has thus become evident that water is highly detrimental to fuel efficiency in the kiln. In order to attain high fuel efficiency it is thus advisable to eliminate all possible water from the kilns.

The higher percentage of carbon dioxide prevalent in the gases of the dry process kilns thus reflects the lower fuel ratio obtainable with the reduced amount of moisture present. Any abnormalities in the gas analysis should be investigated at once. A well operated plant will reach a steady production stage in the kiln room. A constant check of the gas analysis, however, will materially assist in maintaining these conditions which promote high fuel economy.

The Kiln as a Dryer

A discussion of the relative merits of the wet and dry processes does not lie within the province of this discussion. While it may be advantageous in the preparation of the raw material, the disadvantage of admitting large quantities of water to the kiln with the raw materials is generally recognized.

The rotary kiln as usually constructed and operated is not particularly efficient as a dryer. The gases pass through the rear end at high velocities and the surface exposed is usually small, thus the heat transfer is low and the outer envelope of gases only can give up its heat. The gases thus leave the kiln at high temperatures. This problem has been attacked from several angles and the results have been in accordance with the degree of scientific basis behind the methods and the care with which the engineering details have been worked out.

One fact must not be lost sight of: The balance of the heat absorption in the various parts of the kiln. The heat must be absorbed at various temperatures. The heat remaining in the gases leaving one zone must be sufficient to accomplish the desired work in the succeeding zones with a slight excess. Any large excess remaining in the gases can only result in higher gas temperatures unless it is artificially reduced through excessive radiation or excess air, or water. Normally the heat remaining in the gases leaving the calcining zone will be more than sufficient to evaporate the water in a normal slurry. But the efficiency of heat transfer is so low that the gases must be sufficiently high in temperature to transmit the heat by radiation for the evaporation of the water. This accounts for the high exit temperatures in the ordinary kiln. Probably the highest thermal efficiency will always be attained by the com-

bination of the kiln and the waste heat boiler. The combination of the two allows the use of an efficient burning temperature with efficient heat transfer in the burning and calcining zones with an efficient apparatus for removing the heat from the exit gases. The remaining problem is the elimination of the loss due to the heat lost through the evaporation of the water, which heat cannot be recovered.

Methods Used to Reduce Exit Gas Temperature

Probably the first effort toward attaining higher heat transfer rates in the rear end or drying zone was the introduction of lifter plates to raise the material and give it more intimate contact as it was turned over and new surfaces exposed. These have been used in various forms in the kilns. In some cases these plates have been continued to the center of the kiln, forming compartments similar to the segmental compartments in the cellular dryer. The additional surface exposed undoubtedly increases the heat transfer and reduces the exit gas temperatures but other troubles have been traced to them.

A recent development for increasing the heat transfer has been the attachment of a number of chains in the drying zone in such a manner that they alternately are exposed to the slurry and the gases. The heat transfer by convection and conduction is thus increased materially. The motion of the chains also tends to break up any tendency for the formation of mud rings at the end of the drying zone.

A process is being tried out in England by which the slurry is introduced in the form of a spray which intimately admixes the slurry and the gases. This gives very effective heat transfer. Exit temperatures as low as 275 deg. F. have been claimed with this process. It offers interesting possibilities where waste heat is not considered.

Dewatering the Slurry

Some very promising results have been attained by dewatering the slurry before it is fed to the kilns. This can readily be done by means of the various continuous filters now on the market. The practical development of this process may be the most economical solution to the problem. It allows the saving resulting from the use of the waste heat boiler to produce the power. It allows the benefits of the wet process in the preparation of the raw materials with the low fuel ratio of the dry process. The additional complication of the dewatering equipment with its attendant increased power and operating charges are the detrimental factors. In all probability the present difficulties will be eliminated as the equipment is brought into more general use. Other methods of dewatering may be developed which will more nearly fit the desired conditions. Efforts along this line offer very large economies in fuel and should be carefully studied by the industry.

In Europe, where fuel is comparatively expensive and labor is cheap, the shaft kiln with the fuel and the raw material briquetted together are used to a large extent. The fuel economy of this type of kiln is well known, and is due to the intimate mixture of the fuel and the material. Recently it has been proposed to briquette the material and fuel for the rotary kiln as well. Just how the economy would be effected is problematical but there is a reasonable chance for success to justify someone in making the experiment.

The numerous attempts which have thus been made to eliminate the water in the kiln thus indicate that the detrimental effect is appreciated by the industry and concerted efforts are being made to reduce this source of thermal efficiency.

(To be continued)

900-Horsepower Tube Mill Drives at Southwestern Portland Cement Co.

A Description of the Tube Mill Drives—Clutch Is Integral with the Motor—Automatic Control—Starting and Stopping Done by Mill Operator with Two Push Button Switches—Wattmeter Indicates Operating Conditions

By M. A. HYDE

General Engineer, Westinghouse Electric and Manufacturing Company

THREE large compartment tube mills have been recently put into operation by the Southwestern Portland Cement Company, two units at the Osborn, Ohio, plant, and one at Victorville, California. They are 7 feet in diameter by 40 feet long and are driven by 900-horsepower motors. These tube mills reflect the tendency prevalent in all types of grinding equipment toward units of larger capacity and increased operating economy. When installed these compartment mills carried the heaviest ball charges and were the longest mills installed in the cement industry.

An accompanying illustration shows one of the two Westinghouse motors driving the mills at Osborn. The motor is of the synchronous type with built-in magnetic switch, rated 900 horsepower at 180 r. p. m., 100 per cent power factor, the clutch being 72 inches in diameter. The motor operates on 2200-volt, 3-phase, 60-cycle power with field and clutch on 125-volt D. C. power. The motor starter and clutch control are entirely automatic, push button operated.

Clutch Is Integral with the Motor

The simplicity and compactness of this drive is well shown in Fig. 1. This type of motor represents a slight departure from the hitherto standard arrangement of magnetic clutch drives. The clutch, instead of being mounted between the motor and the tube mill pinion with its driving half on the motor shaft and its driven half on the pinion shaft, is built integral with the motor and its two halves are in reality mounted on the motor shaft. This is accomplished by mounting the driving member of the clutch upon the motor rotor which is in turn mounted upon the motor shaft by a set of roller bearings in such a way that the rotor and driving half of the clutch can turn freely upon the stationary shaft as an axle as long as the clutch is disengaged. The driven half of the clutch is keyed to the motor shaft, and the motor shaft is connected to the tube mill pinion shaft by a flexible coupling. In starting, the motor rotor is brought into synchronism in the usual way with the clutch disengaged, after which the load may be applied by energizing the clutch. This brings the clutch friction surfaces into contact, and the motor shaft and tube mill pinion are thereby brought up to synchronous speed. The motor shaft is coupled to the tube-mill pinion shaft by a Falk Bibby flexible coupling, Style No. BL., No. 1500.

The two 900-hp. units are located one at each end of a line composed of four additional raw tube mills driven by 400-hp. synchronous motors with separately mounted clutches, and three additional 500-hp. motors likewise with external clutches driving finish tube mills. That the two

900-hp. units with built-in clutches do not interfere with the regularity of this impressive row of equipment is due to the compactness of the built-in clutch construction.

Automatic Control

The automatic control for one of these units is shown in Fig. 2 which shows also starters for two induction

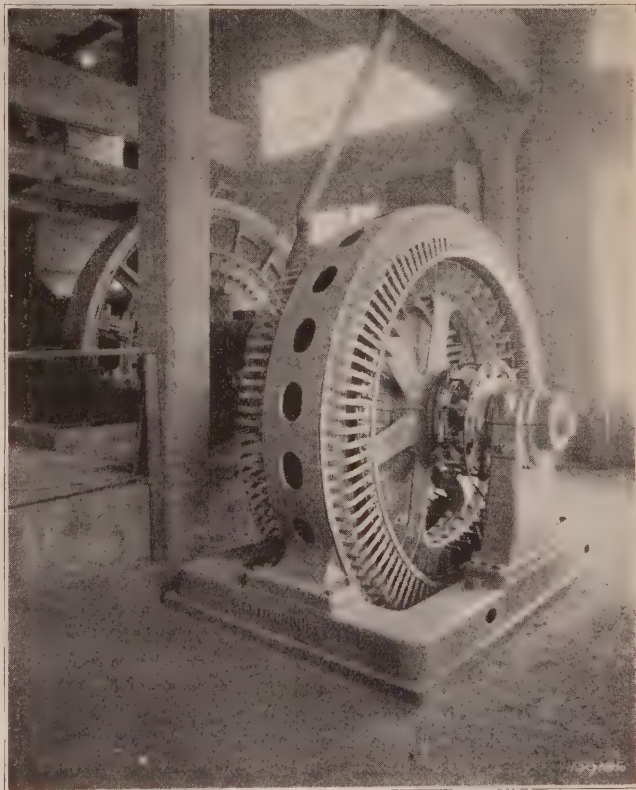


Figure 1

motors driving Fuller-Kinyon cement pumps and one 500-hp. tube mill motor starter. The two separately mounted oil-immersed switches at the left and the third panel from the left comprise the control for the 900-hp. built-in clutch unit on No. 4 finish mill. All starting and stopping is done by the mill operator who has only two push-button master switches to manipulate, one for starting and stopping the motor rotor and the other for engaging and opening the clutch. These are shown in Fig. 3 (the two push-buttons at the left).

When the operator depresses the motor "start" push-

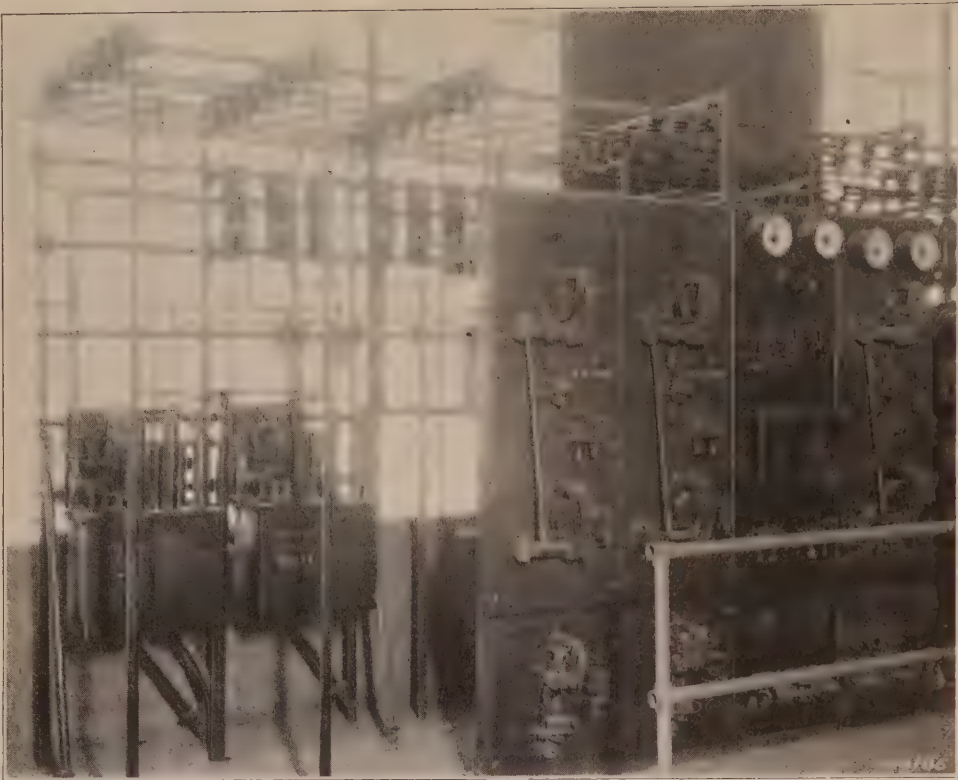


Figure 2



button the following operations are automatically carried out. First the motor armature is connected to a reduced voltage starting bus by closing of the oil-immersed contactor shown at the left in the illustration. The rotor starts off easily being free to turn on the roller bearings, and accelerate to full speed after which the motor field is automatically connected to the direct current excitation supply. Following this operation, the motor is disconnected from the reduced voltage starting bus and the second oil-immersed contactor closes, connecting the armature to the running voltage. If the clutch control circuit is open the rotor idles on the shaft.

When the operator is ready to start the mill he depresses the clutch "start" button, and this results in closing the clutch circuit with resistance in series to assist in limiting the clutch current, after which the motor-operated drum switch (which can be seen at the bottom of the control panel in Fig. 2) shunts this series resistance in steps thus increasing the clutch excitation and causing the clutch to take up the load. The clutch current is increased in a gradual and regular manner not only by the action of the drum switch but also by virtue of the high inductance inherent in the clutch itself. Under the action of this control the clutch, with its inherent inductance and properly proportioned air gaps, takes up the load smoothly and without shock.

The motor starting and clutch control push-button circuits are so arranged that the complete sequence of motor starting and clutch engaging operations may be carried out upon pushing the motor "start" button, or at the operator's will the motor rotor may be started and allowed to idle with the clutch disengaged until such time as it is desired to put the mill into operation by depressing the clutch "start" button. When the mill is in operation the clutch "stop" button may be pressed to stop the mill, leaving the motor rotor in motion, or if complete shut-down of mill and motor is desired this is accomplished by pushing the motor "stop" button which disengages the

clutch as well as taking the motor off the line. In restarting the unit it is impossible for the operator to engage the clutch until the motor itself is on full voltage synchronized and with field excited, ready to take the load.



Figure 3

It can readily be appreciated that the use of automatic control on these installations greatly simplifies the duties of the mill operator. The control station shown in Fig. 3 is located near the feed end of the mill, entirely away from the motor and control panel. So far as the drive of this mill is concerned the mill attendant has only two push-buttons marked "mill" and "clutch" in Fig. 3 to manipulate.

Wattmeter Indicates Operating Conditions

Instead of the ammeter in the motor circuit usually furnished for the guidance of the mill operator, an indicating wattmeter is mounted at the control station, giving conveniently and directly a power indication on the mill operation. In addition to furnishing a check on the condition of the mill and grinding charge, the use of the wattmeter facilitates frequent checks on the relation between power consumed and output of the mill, thus enabling the maintenance of high grinding efficiency.

At the control station there are also mounted three additional push-buttons for the starters of induction motor-driven auxiliaries. Thus complete control of this large unit, constant indication of its operation, and control of its auxiliaries are obtained at one point—the most convenient location for the mill operator.

Middle-West Safety Congress Program Announced

When the First Annual Central States Safety Congress convenes at Kansas City, Mo., April 13, industrialists from the fifteen commonwealths between the Rockies and the Mississippi will have their first chance to get together and discuss common problems. This giant meeting is sponsored by the national and Kansas City Safety Councils and various regional bodies. Opening with a general session April 13, there will follow an industrial general session, at which these subjects will be presented: "Organizing the Plant for Safety," "Every Foreman a Safety Director," and "Keeping the Safety Committee Alive."

The Cement Section of the National Safety Council will be represented by a large delegation, and a special session for this group has been arranged for April 14. W. S. Sabin, of the Portland Cement Association, will preside. H. G. Burgess, Kansas City Public Service Company, Kansas City, Mo., is to tell "How to Keep Men Interested in Their Own Safety." "Getting Men to Report for First Aid," is the subject of a speech by Harold R. Williams, Ash Grove Lime and Portland Cement Company, Kansas City, Mo. Henry A. Reninger, Lehigh Portland Cement Company, Allentown, Pa., speaking on "Fixing Accident Responsibility," will conclude the session.

All sessions affecting the Cement Section will be held at the Muehlebach Hotel. A special rate of one and one-half fares for the round trip on the "certificate plan" will apply for delegates attending the Congress.

University Offers Opportunities in Chemical Engineering

Fellowships and opportunities in chemical and metallurgical engineering at the University of Michigan, Ann Arbor, Michigan, are included in the facilities for graduate work. One of the fellowships is that of the Michigan Gas Association in Gas Engineering, which has been maintained by the association continuously since 1900, and is believed to be the oldest industrial fellowships in the United States.

The summer session of eight weeks commencing June

27th offers an opportunity to practicing engineers and teachers to pursue graduate and undergraduate courses for university credit. Eight courses in chemical and metallurgical engineering are offered. A special bulletin describing the summer school courses of this and other departments will be mailed on request made to the Department of Chemical Engineering, University of Michigan, Ann Arbor, Michigan.

Government Tells How to Store Explosives Safely

The method of construction of magazines for explosives and the situation of magazines in relation to other structures, roads, or workings, is governed by law in many states, says the Bureau of Mines in Technical Paper 400, recently published. Where there is a choice of location, storage magazines should be built at such a place that the explosive need be handled but a minimum number of times in order to bring it to the mine entrance.

As the explosives usually deteriorate with age, whenever it is practicable not more than a 30 days supply of explosives should be contained in a storage magazine at any one time.

Fresh supplies of explosives should be so placed in magazines that the old stock may be used first. All of any particular class and grade of explosive on hand in a magazine when the supply is replenished should be used before any of that in the new lots.

Cases of any dynamites other than gelatins should be so piled that the cartridges lie horizontally, in order to lessen the possibility of leakage of nitroglycerine from the explosive. Gelatin dynamite may be piled in any position.

Discussion of Lime Hydration at Lime Symposium

The problem of lime manufacture will be discussed during the Lime Symposium at the meeting of the American Chemical Society at Richmond, Virginia, April 11 to 16, by F. W. Adams, Director of the Bangor, Me., station of the School of Chemical Engineering Practice of Massachusetts Institute of Technology. Mr. Adams has been engaged during the past two years on a systematic investigation of the requirements of the hydrate for certain uses and the conditions affecting its properties.

Richard K. Meade, an authority on the subject, will discuss kiln design. Papers on "Lime Kiln Fuel Efficiencies," by Asbe; "Lime Hydration," by Adams, and "Lime Research," by Haslam, will also be of interest.

Special Codes Approved for Explosion Prevention

Special codes for the prevention of explosions in pulverized fuel systems have been reviewed and approved by the enlarged sectional committee sponsored jointly by the Fire Protection Association and the U. S. Department of Agriculture, and by the American Engineering Standards Committee. It is confidently believed that as the use of these codes is extended to cover all of the industries affected, disasters will be practically eliminated. A code to prevent the same hazard in coal mines through the process of rock-dusting the mines, which was completed last year, has already shown valuable results.

Cement Industry of Great Britain in 1926

Past Year Was Trying Period for British Cement
Manufacturers — Coal Shortage Worked Hard-
ship—High Early Strength Cement Production
Doubled in 1926—New Plants

IN common with all large industries, the portland cement industry of Great Britain passed through a particularly trying year in 1926. The only raw material for which cement manufacturers are dependent to any considerable extent upon outside supplies is coal, and as the cement works of the country probably consume over 2,000,000 tons per annum, any interruption in the regular supply is a very serious matter.

Throughout the greater part of 1926 coal of indifferent quality was obtainable only with some difficulty and at high prices. From May onward its cost continued to soar until over £3 (\$15.00) a ton was paid at some works, and when it is remembered that one-half ton of coal is required for every ton of cement produced, it will be recognized that manufacturing costs were enormously increased. Nevertheless, no part of this extra cost was passed on to consumers until the end of October, and then only to the extent of a temporary surcharge of 10s (\$2.50) per ton, which was taken off again in December, when the price of coal was less but still above normal. Notwithstanding the coal strike, cement production was well maintained and consumers found practically no difficulty in obtaining supplies.

High Early Strength Cement

The total output of portland cement in the United Kingdom is now approximately 5,000,000 tons annually, the bulk of which is absorbed by the home market. Of this total an ever-increasing proportion consists of rapid-hardening cement. Although only about two years have passed since "ferrocrete," the first cement of this type was put on the market by the Associated Portland Cement Manufacturers, the demand has increased with rapid strides. In addition to its rapid hardening properties and great strength the price of the product is only slightly higher than that of ordinary portland cement. The sales of the product in 1926 were at least double those for the preceding year, and the opinion is held in many quarters that the time is not far distant when rapid hardening cement will be the standard cement for structural purposes. A few concerns are producing the special aluminous cement which complies with the requirements of those who find that the advantage of extra rapid hardening compensates for the higher cost of the product.

New Plants

Convincing evidence of the increasing employment of cement and the confidence of manufacturers in the future prosperity of the industry is to be found in the establishment in different parts of the country of new cement works, and in the extension of plants in various existing manufacturing factories. The new works of Eastwoods Cement, Ltd., in Cambridgeshire, the Holborough Cement Co., Snodland, Kent, and the Dunstable Cement Co., showed satisfactory

results for the first year of operations. The first kiln was lighted up at the reconstructed works of Associated Portland Cement Manufacturers at Bevans, and large contracts were entered into for the provision of new plant and machinery at many of the older factories with the object of keeping pace with modern requirements for the production of high quality cements. In this connection, it is significant that the best brands of British cement are considerably stronger and in all respects better than the standard product demanded by the revised specification of the British Engineering Standards Association, and that even the present high qualities are being continually improved upon by leading manufacturers.

French Government to Control Bauxite Production

By THEODORE WOLFRAM

The French government is becoming alarmed over the development of the bauxite mining in the country and is seeking means to gain some definite sort of control over this industry so important in the fabrication of aluminum and alumina cement. France contains some of the largest and purest bauxite deposits in the world but at the present rate of production these deposits threaten to be worked out within twenty-five or thirty years.

Up to the present the bauxite deposits belong to the proprietors of the ground on which they are located and he has a perfect right to dispose of them as he sees fit without any governmental interference in the matter. Many of the richest deposits are owned and worked by the French producers of alumina cement but others are controlled by English cement producers and also much of the bauxite finds its way into Germany and other foreign countries.

At various times during the past twenty years the government has had under consideration different laws to place these deposits of bauxite under state control and to dole them out as temporary concessions. On account of the many complications resulting from the various forms in which these deposits were already being exploited and the many questions of rights involved, which the government wishes to respect insofar as possible, nothing definite has been accomplished.

At present the government has the intention of again taking up this question but as the proper solution will require a rather long period during which there is the possibility of the matter growing more complicated by the present owners or workers of bauxite concessions seeking to forestall any future action, the French government has placed before the Chamber of Deputies a "decree," which is not intended to interfere with the interests of present producers but simply to prevent any unfavorable change in the situation.

Notes on the Application of Meade's Formula

By W. E. HASKELL
Hollister, Calif.

RICHARD K. MEADE has recently developed a new formula for proportioning the raw materials in cement manufacture. His formula based on the research of Bates and Rankin, considers cement clinker to be composed of di-calcium silicate ($2\text{CaO} \cdot \text{SiO}_2$), tri-calcium silicate ($3\text{CaO} \cdot \text{SiO}_2$), tri-calcium aluminate ($3\text{CaO} \cdot \text{Al}_2\text{O}_3$), and free lime, and assumes that in the best clinker, the silicates are present in about equal amounts.

Upon this assumption he establishes a lime-silica ratio as follows:

Silica	35+26.4	61.4
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$$\frac{\text{Lime}}{65+73.6} = \frac{\text{Lime}}{138.6} = \text{Lime} = 2.3 \text{ Silica when the sili-}$$

cates are present in equal amounts. He also considers that magnesia may replace lime and that ferric oxide may replace alumina in their equivalent amounts, hence his

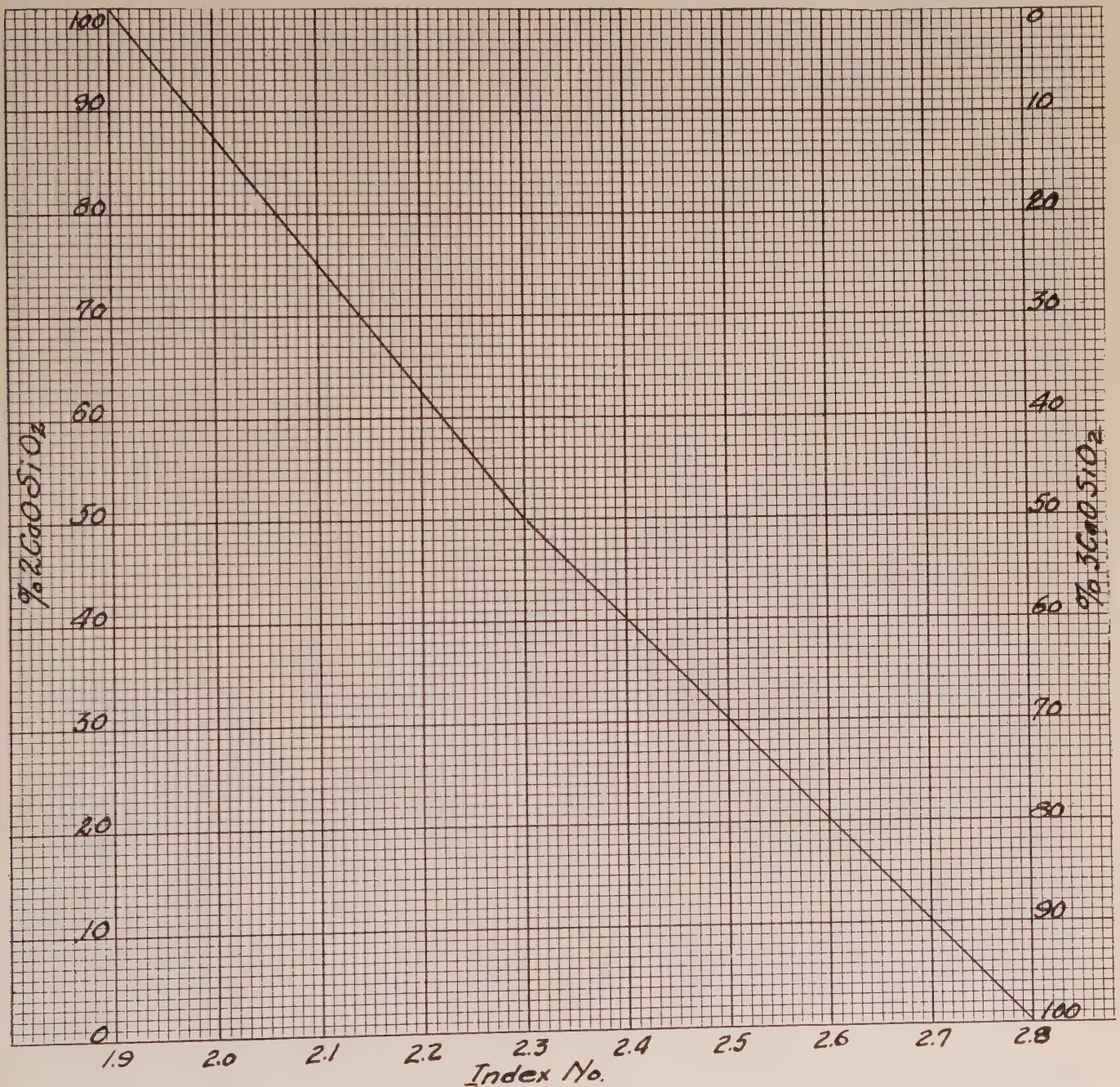


Figure 1

formula:

$\text{Silica} \times 2.3 + (\text{alumina} + \text{iron oxide} \times 0.6) \times 1.7 = \text{lime} + \text{magnesia} \times 1.4 - \text{sulphur trioxide} \times 0.7$.

From this formula it is readily seen that by substituting the percentage values from an analysis and Y for 2.3 and solving for Y that the composition of a cement or clinker can be readily calculated assuming that the composition of the clinker is as considered above.

When using the formula for calculating the composition of a clinker, the analysis of which is known, the writer proposes that the formula be extended to include free lime, the determination of which is now possible with a fair degree of accuracy through the work of Lerch and Bogue.¹

It will be found by using this method that even in good sound clinker, the free lime is sometimes as high as 0.2 or 0.3 per cent and in some cements much higher. This applies of course only when the formula is to be used in calculating the composition from the analysis and the formula then becomes:

$\text{Silica} \times Y + (\text{alumina} + \text{iron oxide} \times 0.6) \times 1.7 = \text{lime} + \text{magnesia} \times 1.4 - (\text{sulphur trioxide} \times 0.7 + \text{free lime})$.

Substituting the percentage values of the analysis and calculating for Y an index number is obtained corresponding to the value of 2.3 in the formula, and knowing the index number corresponding to 100 per cent $2\text{CaO} \cdot \text{SiO}_2$ and 100 per cent $3\text{CaO} \cdot \text{SiO}_2$ and the index number corresponding to 50 per cent of these compounds it is possible to draw a graph from which the percentages of $2\text{CaO} \cdot \text{SiO}_2$ and $3\text{CaO} \cdot \text{SiO}_2$ may be read off. (Fig. 1). In this graph the abscissas, represent the percentages of the two compounds, those to the left of the line being values for $2\text{CaO} \cdot \text{SiO}_2$ and those to the right the values for $3\text{CaO} \cdot \text{SiO}_2$. The ordinates are the index numbers obtained by the formula.

Example

As an example take a cement of the following composition:

	Per Cent
SiO_2	21.5
Fe_2O_3	2.3
Al_2O_3	5.9
CaO	65.4
MgO	1.9
SO_3	1.7
Loss	1.2
Total	99.9

Substituting these values in the formula $\text{SiO}_2 \times Y + (\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3 \times 0.6) \times 1.7 = \text{CaO} + \text{MgO} \times 1.4 - (\text{SO}_3 \times 0.7 + \text{Free CaO}) = 21.5 \times Y + (5.9 + 1.38) \times 1.7 = 65.4 + (2.66) - (1.79 + 0.6)$

$$21.5 \times Y + 12.37 = 66.26$$

$$21.5 Y = 66.26 - 12.37 = 53.89$$

$$53.89$$

$$Y = \frac{53.89}{21.5} = 2.41$$

$$21.5$$

Now by consulting the graph we find the values for index number 2.41 to be 39 per cent $2\text{CaO} \cdot \text{SiO}_2$ and 61 per cent $3\text{CaO} \cdot \text{SiO}_2$, these values being percentages of total silicates.

To calculate the total analysis add the per cents of alumina and the iron equivalent, multiply by 1.7 as in the formula and add the two results. $(5.9 + 1.38) \times 1.7 + (5.9 + 1.38) = 19.65$ per cent of $3\text{CaO} \cdot \text{Al}_2\text{O}_3$. Multiply the per cent of SO_3 by 0.7 and add to the per cent of SO_3 . $1.7 \times 0.7 + 1.7 = 2.89$ per cent $\text{Ca} \cdot \text{SO}_4$. The free lime is of course 0.6 per cent and ignition loss 1.2 per cent, making a total of 24.34 per cent exclusive of the silicates. Now

as the di-calcium silicate is 39 per cent of the total silicates, the percentage of di-calcium silicate in the sample is 39 per cent of 75.66 per cent or 29.5 per cent of di-calcium silicate and the tri-calcium silicate becomes 61 per cent of 75.66 or 46.15 per cent of the cement. The composition of the cement is therefore:

	Per Cent
$3\text{CaO} \cdot \text{SiO}_2$	46.15
$2\text{CaO} \cdot \text{SiO}_2$	29.50
$3\text{CaO} \cdot \text{Al}_2\text{O}_3$	19.65
$\text{Ca} \cdot \text{SO}_4$	2.89
CaO	0.60
Loss	1.20
Total	99.99

Determination of Free Lime

The method of Lerch and Bogue for determination of free lime is as follows:

Reagents

Dissolve 16 grams of dry ammonium acetate in one liter absolute alcohol and standardize with pure CaO in the manner described below.

Dissolve 0.2 grams phenolphthalein in 100 c.c. absolute alcohol.

Determination

Weigh one gram of the cement into a flask, add 30 c.c. absolute alcohol and 6 c.c. glycerol together with 8 or 10 drops indicator.

Heat to boiling and titrate with the ammonium acetate solution to disappearance of the pink color. Repeat the boiling and titrating until the pink color does not reappear after several minutes. From the CaO value of the ammonium acetate solution the per cent of free CaO is readily calculated.

Cement in Japan During 1926

Both the production and consumption of Japanese cement increased during 1926 over the year before. A similar tendency is predicted for the present year. For the last few years cement sales were low, affected by the over-production and financial depression, despite the fact that the demand ought to be active for the reconstruction of the earthquake districts and the rapid increase of concrete building.

It was toward the end of 1924 that the Japan Cement Association adopted a counter step for over-production. This resulted in a gradual improvement. Things improved remarkably during 1926. Products of the first class factories were quoted between 5.80 and 6 yen a barrel toward the end of the year, when stocks were low. This is a gain of about 0.60 yen over the low quotation of 1926 and 0.90 yen over that of 1925. Products of the second class factories advanced sharply to 1.50 yen from the low rate to 5.60 yen, coming near the first class products.

The production for last year was 18,405,000 barrels, an increase of 3,853,000 barrels, or 26.5 per cent, over that of 1925, totaling 14,562,000 barrels. This gain is ascribed to the gradual alleviation in the production restriction following the increase of demand. Sales totalled 18,665,000 barrels, of which 16,740,000 barrels were used at home and 1,925,000 barrels were exported. The domestic demand increased 26.3 per cent and the export amount 48.8 per cent, the total being 28.3 per cent, over 1925. Naturally, the amount in warehouses at the end of 1926 was 759,000 barrels, a drop of 28,000 barrels, from that of 1925.

¹ "Determination of Uncombined Lime in Portland Cement" by Wm. Lerch and R. H. Bogue, *Industrial and Engineering Chemistry*, July, 1926.

Cement-Rock Deposits of the Tournai Region, Belgium

By EDWIN C. ECKEL

DURING the period November, 1925, to March, 1926, the writer was enabled to carry out a very detailed study of the iron and cement situation in western Europe, with particular reference to manufacturing conditions and costs in their bearing upon export possibilities. The direct results of this work are, of course, confidential, and entirely in the hands of the enterprising client who financed the investigation. But in the course of the work there were developed certain by-products, in the way of accurate details concerning certain areas or certain types of cement on which our previous knowledge, in America at least, had been deficient. Some of these local studies seem to be of sufficient general interest for publication, and one of them forms the subject of the present paper.

The Tournai region of Belgium is perhaps the oldest steadily-operated cement district in the world; it is easily accessible from Lille in France; the district is so compact, geographically, that a very fair general idea of its conditions can be secured in a two-day stay; and it has some natural conditions which give it promise of becoming somewhat more serious in future than in the past, not indeed as a producer of normal Portland cement, but as a producer of one of the super-Portlands. Nevertheless, so far as I know only one other American—Dr. E. L. Conwell—has made any special study of its conditions; and as my own work offers a considerable amount of additional chemical and geologic detail its presentation today seems fully justified.

General Geology of Tournai Region

In the vicinity of Tournai the uplands are underlaid by rocks of Cretaceous and later ages, which are of no interest in the present connection, though the Cretaceous elsewhere furnishes the chalks and other limestones which are the principal raw materials for other Belgian and French cement regions, to which I may recur in a later paper. At present, however, and with special reference to the Tournai cements, these Cretaceous rocks may be disregarded, except insofar as they constitute the stripping on the uppermost of the Tournai quarries, and fix an economic limit for their exploitation.

The rocks which are of industrial interest at Tournai are a thick series of limestones, very pure in some beds, siliceous in others, but always very low in magnesia—which occur in the Dinantien series of the Lower Carboniferous. They correspond in geologic age, therefore, to limestones extensively used in the United States in Indiana, Missouri and elsewhere.

In the Tournai region these rocks lie almost or quite horizontally, the dips rarely rising to 15 deg. and being more commonly around 5 deg. There are a number of normal faults, with throws of 20 to 50 feet; so that it is unsafe to assume that a special bed, appearing at a certain level in one quarry, will be the same bed appearing at that level in the next quarry.

The total thickness of the Tournai limestone series is around 600 feet. Its exploitation is limited only by the fact that as one leaves the river Escaut the overlying

Cretaceous beds cover the Dinantien limestones too thickly to permit economic extension of the present quarry region. On the other hand, both up and down the river the Dinantien limestones disappear due to folding.

The Limestone Series in Detail

This thick series is made up of limestone beds of varying character and composition. By comparison of the various quarries in the region the following geologic section (Table I) has been worked out by Belgian geologists. I have re-arranged the grouping to better serve our present purpose. The beds are named, in this table, in order from the top of the series downward.

TABLE I. GEOLOGIC SECTION OF THE TOURNAI LIMESTONE SERIES

Character of rock—	Thickness, ft.	Range in lime carbonate, per cent
A. Compact shaly limestones.....	105	66 to 84
B. Compact limestones, several thin shale beds.....	40	66 to 75
C. Crinoidal limestones.....	60	75 to 95
D. Crinoidal limestones, becoming shalier near base.....	75	75 to 85
E. Very pure crinoidal limestones.....	85	90 to 95
F. Crinoidal limestones with occasional shale beds.....	75	80 to 90
G. Crinoidal limestones with frequent shale beds, becoming still more siliceous near base.....	105	65 to 90

Composition of the Compact Limestones

The following table (II) of analyses, taken from quarries all over the Tournai region, represents fairly the range in composition of the compact or non-fossiliferous type of the Tournai cement-rocks:

TABLE II. ANALYSES OF TOURNAI LIMESTONES, COMPACT TYPE

No.	Silica	Alumina	Iron Oxide	Lime	Lime carb.	Magnesia
1	10.18	3.37	0.43	47.40	84.70	0.44
2	11.21	3.42	0.39	46.89	83.78	0.40
3	14.11	1.56	0.72	45.56	81.35	0.99
4	16.45	1.25	1.09	44.19	78.91	0.70
5	14.98	2.36	0.87	44.07	78.70	0.88
6	14.57	3.95	0.49	43.89	78.37	1.01
7	17.26	2.81	0.47	43.24	77.21	0.68
8	16.82	2.83	0.52	43.37	77.44	0.89
9	15.97	2.76	0.63	43.35	77.41	1.16
10	16.08	3.35	0.93	42.96	76.71	0.95
11	17.63	2.84	0.58	42.81	76.44	0.86
12	17.83	3.21	0.89	42.11	75.20	1.04
13	18.65	1.66	0.69	42.09	75.16	1.47
14	16.98	2.67	1.23	41.58	74.25	1.85
15	18.50	2.45	1.30	41.28	73.71	1.53
16	19.12	2.25	0.67	40.73	72.73	2.06
17	20.13	3.75	0.81	40.46	72.25	1.04
18	20.11	2.68	1.36	40.00	71.42	1.74
19	20.12	2.51	1.19	39.98	71.38	1.92
20	19.52	2.91	1.73	39.17	69.94	2.57
21	25.34	2.26	0.77	38.65	69.01	n.d.
22	29.90	1.73	1.12	36.24	64.71	1.04
23	38.11	2.17	0.84	32.16	57.42	n.d.

The following table (III) shows the striking regularity in composition of any individual bed in this thick series,

the different samples here being taken each from a different quarry, but all from the same easily-recognized bed:

TABLE III. ANALYSES OF SAME BED FROM NINE DIFFERENT QUARRIES

No.	Silica	Alumina	Iron Oxide	Lime	Magnesia	Lime carb.
1	14.73	3.92	1.05	43.62	0.75	77.89
2	14.10	2.98	0.87	44.51	0.90	79.48
3	15.99	2.94	1.17	42.83	1.15	76.48
4	16.37	3.49	1.09	42.70	1.06	76.25
5	17.33	3.92	0.85	42.05	0.81	75.09
6	16.92	3.19	0.79	42.35	1.09	76.62
7	15.26	3.32	1.12	43.70	0.77	78.03
8	16.90	3.29	0.66	42.47	1.13	75.48
9	17.21	3.49	0.78	42.60	0.88	76.07

Composition of the Crinoidal Limestones

A little earlier it was noted that, in addition to the compact limestones, free from visible fossils, there occurred in the Tournai series certain beds of very fossiliferous type, the rock being essentially made up of fragments of crinoid stems embedded in a ground-mass of shaly limestone. In the following table (IV) are given a number of analyses from various quarries and beds in the Tournai region, of these crinoidal limestones in various degrees of purity.

TABLE IV. ANALYSES OF CRINOIDAL LIMESTONES, TOURNAI REGION

No.	Silica	Alumina	Iron Oxide	Lime	Magnesia	Lime carb.
1	2.68	0.47	0.31	52.86	0.78	94.39
2	2.28	0.73	0.67	52.72	0.74	94.14
3	4.32	0.67	0.51	52.45	0.47	93.66
4	5.63	1.47	0.86	50.84	0.35	90.79
5	9.91	1.28	0.76	48.81	0.14	87.16
6	10.33	0.96	0.80	48.23	0.62	86.12
7	11.44	2.23	0.93	47.33	0.17	84.92
8	13.08	2.44	0.96	46.30	0.21	82.68
9	21.32	1.76	1.12	41.96	0.23	74.92
10	22.72	1.33	1.06	41.54	0.16	74.17

Present Status of the Tournai Region

In the Tournai district, based upon the series of lime stones that have been described, there has been for many centuries an important lime industry. During the eighteenth century the value of the hydraulic limes of this region was recognized; and in the latter part of that century the natural cement industry was taken up. Still later, around 1830 to 1850, certain beds were selected for use in making the well-known "natural Portlands"; while within the past two decades the manufacture of true artificial Portlands has taken root in the region. Given the character of raw material available, it is practically certain that the super-Portlands will also be manufactured here in the very near future.

The tonnage importance of all this mass of cementing materials has been increasing in a rather steady way for a century past. Around 1830-1850 the total output of lime and cement in the Tournai region has been estimated at some 100,000 tons per year; while by 1865 it had reached 262,000 tons yearly. In 1900 the total Tournaissienne output was 469,000 tons. By 1906, rising as did all the cementing material industries in other countries, the Tournai region produced 500,000 tons of lime and 500,000 tons of cement per year. The three pre-war years, 1911, 1912, 1913, averaged 1,400,000 tons a year, of which some 650,000 tons of lime as against 750,000 tons of cement.

The region was shut down and damaged temporarily by the war, but by 1922 it had been rebuilt so as to give practically a million tons of lime and natural cements and some 300,000 tons of artificial Portland. There are now 34 companies operating 70 quarries, engaged in the lime and cement business in the Tournai region. At a later stage it may be possible to make some suggestions regard-

ing its future possibilities but at present that matter does not need discussion.

It might be noted, however, that another phase of the Tournai limestone industry is of present and future importance in this connection. The network of canals in that region, and the low water-transport rates, make it easily possible to ship the high-grade limestone down to coast mills and blast-furnaces, where the other necessary raw materials (coke, bauxite, etc.) can be more cheaply supplied.

Investigation of Low Grade Bauxite

In the investigation of the beneficiation of low grade bauxite being undertaken by the Southern Experiment Station of the Bureau of Mines, Birmingham-Tuscaloosa, Alabama, the bauxites will be considered as being of two types, namely, high silica bauxites and high iron bauxites. Material of the first-named class has been obtained from Colbert County, Alabama, and of the last-named class from Cherokee County in the same state. In the case of most high silica bauxites, the main difficulty will be to separate the clay from bauxite minerals. In attempting to work out this problem float-and-sink tests will be made on various screen-sized products, to determine the degree of crushing which will be required to liberate the mineral from the gangue. The washing out of the clay after crushing will very likely involve the use of peptizers for dispersing the clay so as to keep it in suspension as there is not enough difference in specific gravity between gangue and mineral to permit the use of ordinary methods of gravity concentration. In the case of high iron bauxite, it may be found possible to remove a large proportion of the iron minerals by tabling and other gravity methods. A series of float-and-sink tests will be made to determine whether or not such methods will be practicable.

The problem of finding a satisfactory dispersing reagent for the clay contained in bauxite has been assigned to one of the University of Alabama fellowship men co-operating.

The float-and-sink work has been assigned to two fellowship men, with one investigating the high silica bauxite, and the other the high iron bauxite. Upon completion of this preliminary work, an attempt will be made to apply in a practical way, by means of laboratory machines, the information obtained from preliminary tests.

Asano Portland Cement Company Absorbs Super-Cement Firm.

On March 1, the Asano Portland Cement Company absorbed the Asano Super-Highgrade Cement Company. The latter firm was established on December 25 with Soichiro Asano as president. Its capitalization was 50,000,000 yen, of which 12,500,000 yen had already been called in. As a result of the absorption, the Asano Portland Cement Company is to increase its capitalization from 56,310,000 yen to 106,310,000 yen.

Japanese Agreement Calls for Inter-Plant Co-Operation

The Sakura Portland Cement Company, a second-class firm, has concluded agreement with the Oita Portland Cement Company for business co-operation. The Sakura interests are capitalized at 1,600,000 yen, fully paid up. The business co-operation involves the buying of the Sakura shares by the Oita interests, the management of business by the Oita firm in behalf of the Sakura concern, and other necessary items. The Sakura concern retains its name but in fact it is to be solely controlled by the other.

EDITORIALS

Rapid Hardening Cement

RECORDS of cement production in Great Britain, as shown on another page in this issue, indicate that during the year 1926 the sales of rapid hardening portland cement more than doubled those of the preceding year.

Rapid hardening portland cements have now been used with outstanding success in Europe for a number of years. Their use is now far past the experimental stage. Structures in which they have been used have stood the test of years and have proven sound; in fact, some engineers are of the opinion that concrete made from these cements is more immune from attack by the elements than concrete made from some ordinary portland cements.

In the United States, also, interest in high early strength portland cements is increasing. Some cements of this kind are already on the market and are meeting with the approval of the buyers. Other American cement mills are already equipped, or are now equipping to make cements of this character. Chemists are busy experimenting with the raw materials available at their plants. In the older mills, new equipment, especially adapted for manufacturing cements of this kind is being purchased and installed. New equipment is being developed with this object in view and foreign equipment manufacturers are entering the American market especially because of the developments in special cements.

New cement plants are built and designed with this ultimate product in view. In fact, many plants have already made special cements in quantity so as to get a line on chemical control, manufacturing costs, and market reactions. The stage is set to present these "special" cements to the American buyer. He needs them and wants them. The cement industry cannot help but accede to his demands.

Many executives of cement companies frankly admit the trend toward the use of special cements. They are also frank in saying that it will be only a matter of time before such cements will be available everywhere. Just when this will be the case is still uncertain.

A general disregard of existing standard specifications could not help but throw the cement industry into a chaotic condition. But is there no orderly, constructive way in which these "super" or "special" cements can be placed on the market without unduly harming the manufacturer who prefers to make only the standard grade of portland cement?

There will always be a large market for standard portland cement. The big farm market is probably best served by standard cement, as is also most mass concrete work. Many users do not now make the

best use of the cements they have available. There will always be a large amount of work for which high early strengths will be unnecessary.

But there are many experienced, intelligent users of cement who want to capitalize the advantages of high early strength. They are men who design their mixes so as to get the greatest value per dollar invested. They are interested in the savings made possible by removing forms earlier, or by cutting down curing and storage space in the block plant or by taking advantage of the many other savings that follow high early strengths. Then, too, from the owner or taxpayer's point of view there is the economic advantage of using the building or pavement sooner.

It is for such uses that buyers want special cements. And usually they are willing to pay a differential in price to secure these advantages. Buyers are on the lookout for high early strength qualities in the cements that are now available. When they find, or think they find, a brand that meets these requirements they are willing to pay higher freight charges to get that particular brand on their job. And they buy it as one of several portland cements that are claimed to have different qualities. The buyer is confused by the many conflicting claims made for these cements.

Is not such a condition more harmful to the cement industry at large than a definite marketing policy that sells one grade of cement as standard at a given price and another as special at a higher price? By frankly manufacturing and labeling different grades of portland cement as "standard" and "special" and marketing them as such, many of the present unsatisfactory sales conditions would automatically right themselves. Competition would again be placed on a more equal basis. The buyer would be enabled to fill his requirements for quality with the assurance that he was getting either a "standard" or a "special" cement instead of being confused by claims and counter claims that certain brands are in reality special cements even though they are marketed as "standard."

Is it not time now to face this problem of change frankly and squarely and develop an orderly plan for merchandising under these new conditions? The cement industry is not entirely free from criticism by users in this matter. Evidences everywhere point to the fact that a definite demand for high early strength cements has developed and that that demand is now, in a fashion, being met. The present situation is far from satisfactory. Unless conditions can be put back on the basis that existed before these "superior" portland cements were placed on the market, it seems that the adoption of more than one standard quality of cement is the only logical way to meet the present problem. It is not too early now to prepare for it.

Cement Statistics for February

FEBRUARY shipments of Portland cement show an increase of nearly 13 per cent as compared with January, 1927, and an increase of nearly 16 per cent as compared with February a year ago, according to the Bureau of Mines, Department of Commerce. February production shows a decrease of 890,000 barrels as compared with the production in January, 1927, due largely to the short month, and a decrease of nearly 5 per cent as compared with February, 1926.

Portland cement stocks are greater than at the end of any other month and are over 5 per cent in excess of the stocks at the end of February, 1926.

Estimated Clinker (Unground Cement) at the Mills at End of Each Month, 1926 and 1927

(Figures represent thousands of barrels)

Month	1926	1927
January	9,074	*9,989
February	10,931	12,082
March	12,290	
April	12,967	
May	11,695	
June	10,144	
July	8,604	
August	7,362	
September	6,112	
October	5,370	
November	5,748	
December	7,799	

*Revised.

Production, Shipments, and Stocks of Finished Portland Cement, by Months, in 1926 and 1927

(Figures represent thousands of barrels)

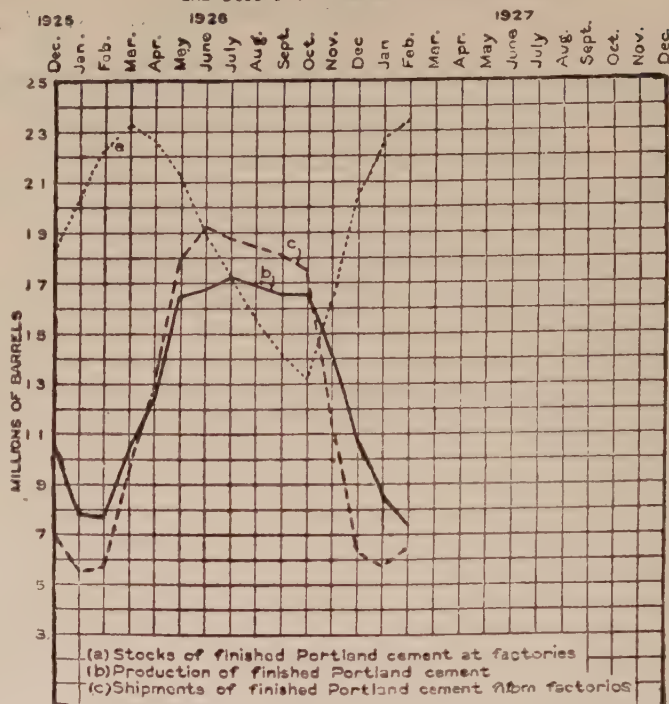
Month	Production		Shipments		Stocks at end of month	
	1926	1927	1926	1927	1926	1927
January	7,887	*8,258	5,674	*5,968	20,582	*22,914
February	7,731	7,368	5,820	6,726	22,385	23,556
March	10,390		9,539		23,236	
First quarter	26,008		21,033			
April	12,440		12,965		22,710	
May	16,510		17,973		21,255	
June	16,866		19,134		19,000	
Second quarter	45,816		50,072			
July	17,134		18,812		17,301	
August	16,995		18,583		15,718	
September	16,571		18,087		14,188	
Third quarter	50,700		55,482			
October	16,596		17,486		13,334	
November	14,193		11,276		16,243	
December	10,744		6,432		20,616	
Fourth quarter	41,533		35,194			
	164,057		161,781			

*Revised.

Commercial District	Production—February		Shipments—February		Stocks at end of Feb.		Stocks at end of Jan., 1927*
	1926	1927	1926	1927	1926	1927	
Eastern Pennsylvania, New Jersey, and Maryland	2,447	2,353	1,137	1,708	5,115	5,761	5,116
New York	288	229	145	215	1,590	1,452	1,438
Ohio, Western Pennsylvania, and West Virginia	739	865	402	543	2,792	2,942	2,620
Michigan	288	263	237	334	1,947	2,021	2,093
Wisconsin, Illinois, Indiana, and Kentucky	775	450	649	652	3,700	3,239	3,441
Virginia, Tennessee, Alabama, and Georgia	1,029	1,020	937	992	1,058	1,195	1,167
Eastern Missouri, Iowa, Minnesota and South Dakota	483	404	396	362	3,066	3,241	3,199
Western Missouri, Nebraska, Kansas, and Oklahoma	361	236	518	527	1,399	1,556	1,847
Texas	393	396	400	382	488	475	461
Colorado, Montana, and Utah	70	65	106	101	357	482	518
California	743	888	765	736	507	704	551
Oregon and Washington	115	199	128	174	366	488	463
	7,731	7,368	5,820	6,726	22,385	23,556	22,914

*Revised.

Monthly fluctuation in production, shipments and stocks of finished Portland cement



(a) Stocks of finished Portland cement at factories
(b) Production of finished Portland cement
(c) Shipments of finished Portland cement from factories

MEN and MILLS

Notes from the Field

Arkansas Considering State Plant for Fort Smith

The feasibility of locating a state cement plant at Fort Smith, Arkansas, to manufacture cement for road building is being investigated by a special committee appointed recently by R. C. Coffy, chairman of the industrial committee of the Chamber of Commerce.

The plans of the industrial committee for locating a cement plant in Fort Smith were approved recently at a meeting of the directors of the chamber. The directors also adopted resolutions calling on the legislature to pass a bill to provide adequate funds for the operation of the state geological department.

Telegrams explaining the board's action have been sent to Governor Martineau, members of the senate and house and to all chambers of commerce in the state.

If the special committee's investigation is favorable to locating a cement plant in Fort Smith, plans for obtaining such a plant will be taken up immediately, Mr. Coffy said.

"Few persons realize that Fort Smith is ideally located for the manufacturing of

cement, having most of the necessary features at its door," Mr. Coffy stated recently. "There are no plants in the state, but three good locations and Fort Smith is one of them. The highway department is to spend \$13,000,000 a year for four years and it is estimated the program will call for 5,000,000 barrels of cement, which would mean a tremendous saving if we had a plant. We have cheap fuel and transportation with five main line railroads radiating in every direction and in addition we have the necessary limestone and shale in unlimited quantities.

"A large amount of the cost in road building is in freight rates. We already have the sand and gravel plants and with cement plants it would mean we could build our roads with strictly home material."

The subject of locating a cement plant here was discussed first by Harry Kelley with Milton H. McConnell, secretary of the chamber. McConnell took the matter up with the industrial committee, which began work on the project about two weeks ago.

White Cliffs Mill Planned as Result of Bill

Passage recently by the legislature of Senate Bill No. 348, authorizing the Arkansas Highway Commission to purchase road building material in Arkansas, has given encouragement to officials of the White Cliffs Development Company in Little River county, where plans are being made to establish a large cement industry, along with other chalk products works.

The bill passed by the Senate does not make it mandatory that the highway commission buy Arkansas road materials, it was brought out, but it does encourage this practice whenever other considerations are equal.

The White Cliffs chalk deposit, from which the cement is manufactured, is a part of a series of deposits which crop out first in northeast Texas and extend northeast through the southwest part of Arkansas.

The White Cliffs deposit is estimated, according to George C. Branner, state geologist, to contain approximately 150,000,000 tons of chalk. A deposit in the vicinity of Foreman, also in Little River county, contains, Mr. Branner said, about 500,000,000 tons, while a deposit at Saline Landing, a few miles to the north, is so vast no estimates have been attempted.

The White Cliffs Development Company owns 2600 acres of land in Little River and Sevier counties, including the White Cliffs deposit and others, bringing its total available chalk to 400,000,000 tons, according to A. B. Banks of Little Rock, president of the company. Mr. Banks already has announced plans to undertake the development of a big cement plant on the property.

Development of the White Cliffs deposit has been held up owing to excessive fuel costs and until the last few years lack of adequate rail facilities. The deposit has been worked at intervals for many years, and approximately 30 years ago experiments were made in the use of cement from the deposit in building sidewalks in Little Rock. These walks, it was declared recently, still are in good condition.

This company has now in operation a pulverized lime plant and is also prepared to furnish pulverized limestone for agricultural purposes, asphalt filler, etc. The capacity of the lime plant will be 60 tons per day.

Gulf Coast Shell and Cement Company Plans Announced

The Gulf Coast Shell and Cement Company, Houston, Texas, is reported to be assembling equipment for a shell handling plant at an estimated cost of \$150,000. Plans include the erection of a cement manufacturing plant in the Gulf Coast region adjacent to the shell banks and the construction of 18 barges. Loading machinery will be installed to handle 1000 yds. daily, and the channel deepened into Collegeport harbor.

Majority of Volunteer Stock Sold

Stock to the extent of \$900,000 has been subscribed to in the establishment of the new Volunteer Portland Cement Company, Knoxville, Tennessee. The remaining \$100,000 in shares will be placed on the Knoxville market. The organization is now complete and a charter has been applied for. J. Ross Hanahan is president of the company; Howell Davis, vice-president, and local directors are Weston M. Fulton, C. M. Moore and Howell Davis.

Lime Products Plant to Begin Operation June 1

The new lime plant of the New Jersey Lime Products Corp., Ogdensburg, N. J., of which Richard K. Meade & Co., Baltimore, Md., are the engineers, is now nearing completion and it is anticipated will be burning lime about June 1st.

The present plant will employ a rotary kiln and will be the first unit of what is destined to be one of the largest lime plants in Eastern Pennsylvania. Its raw material consists of a very pure calcite.

On burning, the latter falls to granules so that the lime will be in the granular condition so popular with the Eastern trade.

The equipment is thoroughly modern and up-to-date. In order to produce the very best quality of lime, oil will be used for fuel and the raw materials will be under the constant supervision of Richard K. Meade & Co., who will act as consulting engineers and chemists after the plant is placed in operation.

Cement Company Head to Have Freighter Named for Him

To be used in the iron ore, limestone and coal trade on the Great Lakes, the new 600-foot steamship, "B. F. Affleck," is now being built for the Pittsburgh Steamship Co.

This modern 10,000-ton steel freighter under construction at Toledo is one of two ships that are being added to the Pittsburgh Steamship Co.'s fleet. It is named for Benjamin Franklin Affleck, president of the Universal Portland Cement Co.

Enlargement of lake-carrying service is in line with other recent activities of the Universal Company which is just completing a three-million-dollar expansion program at its Chicago (Buffington, Ind.) plant which includes construction of a new harbor, dock, storage yard and light-house. This development will make possible prompt shipments by boat of finished cement to all lake ports as well as expeditious receipt of raw material from quarries.

Triple-expansion engines and three Scotch marine boilers make up the motive power for the new boat. The vessel will be launched at an early date.

Former Chief Engineer Back to Richard K. Meade & Co.

Joah Etchells, who has been acting for the last two years as chief engineer for the National Cement Co., Montreal, Quebec, has returned to his former employers, Richard K. Meade & Co., Baltimore, Md., and will be chief engineer for that organization.

Mr. Etchells is a graduate engineer of the University of Pennsylvania and has had many years' experience in the design, construction and operation of cement, lime and plaster plants. He was chief engineer for Richard K. Meade & Co. during the design and construction of the National Cement Co.'s new plant at Montreal.

Southwestern Loses Second Executive in Month

Death again claimed one of the Southwestern Portland Cement Company's staff on March 11th, when H. C. Swearingen, sales manager at the El Paso, Texas, plant, passed away. Mr. Swearingen had seen fourteen years' service with the firm.

Burial took place at Crawfordsville, Indiana.

Union City Peerless Plant Reopens

With the first of March, the Peerless Portland Cement Company again resumed operations at its Union City, Michigan, plant.



An old vertical kiln first used by the Alamo Cement Company in the last century and located in what is now Breckenridge Park, San Antonio, Texas

Banker Becomes a Director of Bessemer

Richard Inglis of Otis & Co., Cleveland banking house, has been elected a director of the new Bessemer Limestone & Cement Co., recently purchased by the Standard Slag Co. for \$5,500,000. Other directors are W. G. Scheub, Toledo; H. N. Snyder, Buffalo, and L. A. Beeghly, W. E. Bliss, Charles Schmutz, R. C. Steese, Philip Wick, E. E. Swartswelter and W. H. Kilcawley, all of Youngstown. Mr. Beeghly, president of the Standard Slag, was elected president, and W. E. Bliss, vice-president.

New Vice President for North American

Luther G. McConnell has resigned as vice president of the North American Cement Corporation, Albany, New York, to become an officer of a New York bank.

Frederick A. Boeye succeeds Mr. McConnell, and continues also in his position as general sales manager, assisted in that capacity by Thomas J. Harte.

Eminent German Cement Man Passes Away

Dr. Phil. Heinrich Julius Muller of Kalkberge, Mark, Germany, and director of the German national cement manufacturing organization, died February 20 after a serious illness.

Dr. Muller visited the United States in 1924 on a tour of inspection of American mills.

New Keystone Plant Retains Engineers

Richard K. Meade & Co. have been retained as designing and consulting engineers for the new plant of the Keystone Portland Cement Co. which is to be built at Bath, Pa. The new plant will have a capacity of 3000 barrels per day, will employ the wet process and will be the second modern plant to be built in the Lehigh District. The new plant is to be built just outside of the Borough of Bath, Pa., and between the Lehigh mill and the town.

The officers of the company are: John Buckland, president; Fred B. Franks, vice-president and general manager, and the Hon. E. J. Fox of Easton, Pa., treasurer.

Mr. Franks originally built the plant of Wm. Kraus & Sons at Martins' Creek some 25 years ago. This plant was later purchased by the Alpha Cement Co. Mr. Franks then organized and built the plant of the Bath Portland Cement Co. at Bath, Pa., which plant was sold some years ago to the Lehigh Portland Cement Co. John Buckland is president of the National Slag Co. of Allentown. Mr. Fox is a prominent attorney of Easton, Pa., president of the Easton Trust Co. and a former associate justice of the Pennsylvania Supreme Court.

Consolidated Corp. Makes Transfers to Chicago Office

Hiram Norcross, vice-president of the Consolidated Cement Corporation and formerly in charge of the Kansas City office, has been transferred to the main office at Chicago, Mr. Norcross now has charge of Cement Sales of the firm, which includes three plants located at Cement City, Michigan, and Fredonia and Mildred, Kansas.

Mr. C. W. Rodgers, also formerly of the Kansas City office, has been transferred to the sales department at the Chicago office. Sidney Smith has joined the Kansas City force of the Consolidated Corporation, to fill the position held by Mr. Rodgers.

Allentown Company Stockholders Meet in Catasauqua

Virtually all of the 500 stockholders of the Allentown Portland Cement Company were present at the annual meeting in Catasauqua, Pennsylvania, recently. The following directors were re-elected: Col. James W. Fuller, Sedgwick Kistler, George C. Hetzel, Alfred E. Douglass, James W. Fuller, 3rd, Ralph S. Weaver, George W. Aubre and E. A. Weibel.

Foreman of Atlas Mill Passes Away

James Gibson of North Catasauqua, Pennsylvania, for forty-one years foreman of Mill No. 4 of the Atlas Portland Cement Company, died recently.

Bessemer Bonds Go on the Market

Wick & Co., brokers of Cleveland, O., are offering \$2,000,000 first mortgage, 20-year, 6½ per cent gold bonds of the Bessemer Limestone & Cement Co., at par and accrued interest from Feb. 1, 1927.

Sinking fund provisions call for a semi-annual payment of \$110,000 to the trustee, the Guardian Trust Co., of Cleveland. Of this amount interest requirements are first met, the balance being used for the retirement of bonds by lot. It is estimated that the sinking fund will retire about 85 per cent of the total issue before maturity.

The new Bessemer concern is incorporated under the laws of Delaware and is headed by L. A. Beeghly, president of the Standard Slag Co., and his associates. Capitalization of the new company, besides the bond issue will consist of 50,000 shares of "A" common no par value and 100,000 shares of "B" common no par value.

The "A" common will be offered to the public at \$31 in the near future, while Mr. Beeghly and his associates are putting \$2,000,000 in the company for the "B" shares. This places \$3,500,000 behind the bonds, together with an initial surplus of \$856,252.47. The bond issue is less than one-half of the amount paid in cash for the holdings of preferred and common stocks in the old concern. Butler, Reading & Co., will participate in placing the bond issue.

The company owns a large deposit of limestone at Bessemer, Pa., and its business originally consisted entirely of the production of fluxingstone for the iron and steel industry and crushed stone for construction purposes. In 1920 the company erected a cement plant, which now has a capacity of 1,500,000 barrels for the conversion of limestone into cement, and at present slightly less than 50 per cent of stone produced is used in this plant, the balance being sold largely as fluxingstone to steel companies.

Net earnings of the predecessor company for the four-year period ending with 1926 were \$681,057.83 or 4.19 times maximum annual interest requirements on this issue of bonds. An offering of class "A" stock is expected to follow this offering soon.

Trinity Company Receiving Bids for Wharf Construction

In the course of construction progress, the Trinity Portland Cement Company, Dallas, Texas, is receiving bids for wharf and dock facilities. The wharf will extend along property front on the Upper Ship Channel, approximately 600 ft. long, and 15 ft. above mean low water. The concrete wall will be protected by a timber fender system with floating log protection.

Louisiana Plant Has University Students as Visitors

The new plant of the Louisiana Portland Cement Company at New Orleans was the classroom for eighteen Louisiana State University students recently. The students, accompanied by three university professors, were the guests of Lewis R. Ferguson, manager.

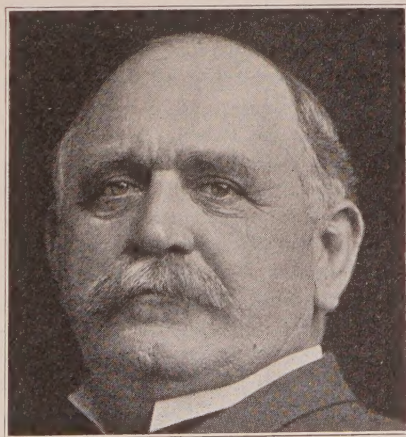
David Hannan, assistant superintendent of the mill and engineer in charge of construction, led the party through the plant. It was the first group to be ushered through the mill. All of the details were explained by guides and the inspection included a passage through the two kilns.

Commission Dismisses Atlas Portland Cement Company Complaint

Washington, D. C.—The Interstate Commerce Commission has dismissed a complaint of the Atlas Portland Cement Company assailing rates on cement during federal control of the railroads from its Ilasco, Mo. plant to destinations in Illinois, Wisconsin, Michigan, Minnesota, Iowa, South Dakota, Nebraska, Kansas and Missouri. The company's claim for reparation was denied. The complaint involved shipments to more than 1,200 destinations and the Commission held that it would be impractical for it to determine whether the rates to each destination were based on the proper distances under its original order in Western Cement rates.

Former Riverside Chemist Becomes Consultant

S. R. Mitchell, chief chemist for the Riverside Portland Cement Company, Los Angeles, resigned recently and now is functioning as a consulting chemist to architects and builders.



A recent portrait of Carl Leonardt, the late founder and president of the Southwestern Portland Cement Company

Commission Finds Kansas Rates Reasonable

Washington, D. C.—The Interstate Commerce Commission found in a report made public March 1 on complaint of the Iola Cement Mills Traffic Association that the interstate rate of 11 cents per 100 lbs. on cement from mills in the Kansas gas belt at Chanute, Fredonia, Mildred, Humboldt, Independence and Iola, Kansas, and Dewey, Oklahoma, to destinations in the Kansas City, Missouri-Kansas, switching district, is not unreasonable. The association mills contended that the rate assailed is unreasonable as compared with the rates on cement from Cement City (Sugar Creek), Missouri, Sunflower and Bonner Springs, Kansas, and unduly preferential of the mills at those points.

The commission held that the interstate rates from Cement City, Bonner Springs and Sunflower to the Kansas City district are and will be prejudicial to the Kansas gas belt mills to the extent that they are lower by more than 4.5 cents than the 11-cent rate from the gas belt mills which was upheld by the commission, making a rate of 6.5 cents from Cement City, Bonner Springs and Sunflower to Kansas City. The commission's order requiring establishment of this rate becomes effective May 12.

Trinity Offers Million-Dollar Gold Bond Issue

The Trinity Portland Cement Company, Dallas, Texas, has offered on the financial market \$1,000,000 first mortgage, collateral trust notes, at 5½ per cent, maturing in three years. The First National Company, the Mississippi Valley Trust Company, and G. H. Walker & Company, all of St. Louis, Missouri, handle the issue. Proceeds will be applied to reduction of present current indebtedness, completion of Houston plant and other corporate purposes.

Ohio Alpha Plant Reopens

The Ironton, Ohio, plant of the Alpha Portland Cement Company, closed since early in December, resumed operation at the beginning of March.

Improvement and extension of the power house has been completed and other new installations put in shape for the coming months.

K. H. Talbot Resigns from Cowham Engineering Co.

Mr. K. H. Talbot has resigned as Manager of Cement Sales of the Cowham Engineering Company, of Chicago, to become Director of Sales for the Koehring Company, Milwaukee, Wisconsin. The latter firm manufactures concrete mixers, pavers and cranes.

Engineers Club Admits More Cement Mill Men

A number of technicians connected with cement mills in the region have joined the Engineers' Club of the Lehigh Valley, which is connected with the Lehigh University at Bethlehem, Pa. This organization is one of the leading institutions in that territory and is frequently addressed by scientists from abroad.

The following are some newly admitted members: E. M. Ayres, chief engineer, Hercules Cement Company, Nazareth, Pa.; R. A. Fogel, chief electrician, Lehigh Portland Cement Co., Bath, Pa.; Asa Haase, chief

electrician, Alpha Portland Cement Company, Plant No. 3, Martins Creek, Pa.; H. H. Heller, Sr., superintendent, Lehigh Portland Cement Co., Bath, Pa.; John H. Kratzer, chief electrician, Lehigh Portland Cement Co., Wescoesville, No. 1, Pa.; John M. Lakas, electrical draftsman, Lehigh Portland Cement Co., Allentown, Pa.; Alfred H. Leh, general foreman, Giant Portland Cement Co., Egypt, Pa.; Herbert Repert, chief electrician, Giant Portland Cement Co., Egypt, Pa., and Roy H. Rohr, chemist, Lehigh Portland Cement Co., Bath, Pa.

SAFETY CORNER

Blasting Dangers Studied at Regional Safety Meeting

Officials and representatives of all cement mills in Alabama, Georgia, Louisiana, and Tennessee attended a regional safety conference in Birmingham, Alabama, on March 15, at which quarry blasting was the chief topic of discussion.

S. C. Jones, explosives engineer of the Dupont Powder Company, spoke on "Use of Explosives in the Quarry."

Julian Harvey, of the National Safety Council, from Chicago, addressed the conference at the afternoon session on "Duties of Plant Foremen," and H. G. Jacobsen, of the Bates-Valve Bag, Chicago, spoke on "Safety in the Cement Industry."

The Alabama Power Company safety

team gave a demonstration of safety work and foremen of cement plants in the four states represented brought the session to a close with five minute talks.

Speed, Ind., Mill Awarded Holmes Safety Certificate

A certificate was awarded recently by the J. A. Holmes Safety Association to the Speed open limestone-rock quarry operated by the Louisville Cement Company at Speed, Ind. No fatal or "lost-time" accidents occurred at this quarry during a period of more than two years from June 1, 1924, to December 31, 1926. A total of 545,497 man-hours, or 60,611 man-days, was worked at this quarry during the period.

Cash Awards Made at Indiana Mill

The Indiana Portland Cement Company, through its Safety First organization, has distributed checks to all men in those departments which went through the year 1926 without a lost-time accident. The plant organization is divided into sub-departments and shifts for the operation and construction work of the plant and these various subdivisions are used also as the units in the Safety First organization.

The departments which received the awards were the Power, Carpenter, Yard, Mill and Kiln, Packing House, Office, Laboratory and Storeroom Departments. All plants of the International Cement Corporation, of which the Indiana Portland Cement Company is a subsidiary, carry on this safety work, and besides the inter-departmental rivalry there is the competition between the eleven plants making up the International system. For the year 1924 the Indiana plant rated fourth in the system.

Besides receiving a cash award, each department will have its name engraved on a large silver loving cup.

Northwestern Awards Contract for Plant Buildings

Contract has just been awarded by the Northwestern Portland Cement Company of Portland, Oregon, to the Pacific Iron Works, also of Portland, for the construction of a machine shop, compressor house, sub-station, store building, office and laboratory at the company's plant at Grotto, Washington, where expenditures of \$600,000 are planned. Manufacturing capacity will be about 1500 barrels per day.

George Macdonald is president of the Northwestern Portland Cement Company; C. T. W. Hollister, secretary and director of sales.

The company reports all but a small portion of its 8 per cent preferred stock, carrying a common stock bonus share for share, sold to Oregon and Washington investors, many of whom already have had profitable experience in investing in cement securities. The Northwestern company is floating no mortgage bonds.

Pennsylvania-Dixie Salesmen's Get-Together Banquet

A get-together banquet meeting of the southern sales forces of the Pennsylvania-Dixie Cement Corporation was held at Kingston, Tennessee, recently. A large number of salesmen and office executives, as well as the forces from the local plant of the company, attended.

Southeastern Portland Cement Association Men Meet

Representatives of the Portland Cement Association in the Southeast, with headquarters in Atlanta, held a banquet in that city recently, as a part of their annual two-day convention. Geo. E. Warren, assistant general manager of the association, and J. M. Marshall, Jr., district engineer at Atlanta, were two of the speakers of the evening.

Bricklaying Contest Promoted by Louisville Cement Co.

Louisville Cement Company representatives, at a meeting of the Mason Contractors' Association in Toronto, Canada, recently, promoted a contest and demonstration in bricklaying, using the product of their mill.

Architects, general contractors, and building material dealers also comprised the audience at a similar demonstration held at a Memphis, Tennessee, hotel by the Louisville Cement Company.

Berkeley County Plant Wins Firm's Safety Trophy

The Berkeley County plant of the North American Cement Corporation, formerly the Security Lime and Cement plant, was presented recently with a bronze trophy for having made the best safety record among its sister plants in 1926. Employees of the county plant, officials of the organization and representatives of two railroads attended the gathering.

Government Figures Show Accident Reduction

Washington, D. C.—A very steady decline in both accident frequency and severity rates in the portland cement industry is reported by the Department of Labor in a bulletin just issued on industrial accidents. The frequency rate declined 40 per cent from 43.50 per 1,000,000 hours' exposure in 1918 to 26.08 in 1925 and the severity rate per 1,000 hours' exposure went down 17 per cent from 6.05 to 5.00 in the same period. The following data was drawn by the Bureau of Labor Statistics from the records of the Portland Cement Association.



Mill Equipment



Improved Arch Construction Creates Much Interest

A flexible arch tile enabling more economical and easier arch construction and maintenance created considerable comment upon being displayed at the recent Chicago Power Show.

The new patented Reintjes flexible arch tile forms its own arch—requiring no temporary arch centers or skewbacks. Only two shapes of tile are needed regardless of thickness of walls or the varying width of span, or whether the door jambs are square or bevelled.

The units remain level with adjacent brickwork without any levelling medium. Each step up is equal to a brick course, the arch being built up in sections the width of one brick course. The tapered key of Reintjes flexible arch tile facilitates repairs. Replacement arches can be driven to a tight fit without disturbing overhead brickwork. The interior section of the arch can be repaired without interfering with the remaining sections.

Reintjes arch tile is ideal to improve arch construction in firing doors, observation doors, relieving arches of side walls, Chicago combustion arches, rear arches H. R. T. boilers, roof arches for any type of furnace, and roofs of gas flues, etc.

This patented arch tile is being marketed by the Geo. P. Reintjes Co., 2517-19 Jefferson St., Kansas City, Missouri.

Special Truck Body Empties Bulk Cement Successfully

An innovation of significance to the cement industry is a method of shipping cement in loose bulk instead of in the customary bags, which has recently been adopted and approved by the Peerless Portland Cement Co., according to the March issue of the *Autocar Messenger*. Although long recognizing the probable economy of such a method in some instances, the industry had not worked out a practical way of shipping the cement loose and yet keeping it protected from the air. Further, it was supposed that any attempt to dump it from a covered truck body would require an 80-degree elevation and possibly a slice-bar as well.

The successful new way uses a special truck body mounted on a 5-ton, 120-inch wheelbase Autocar chassis. The body is covered, and has two manholes in the top for filling. These are protected by watertight covers. The truck is emptied through a water-proof canvas chute at the rear. The cement flows out freely at a 20- to 25-degree elevation.

Gasoline Locomotive Replaces Steam Engine

One of its users reports that the new 25-ton Whitcomb gasoline locomotive replaces two steam locomotives, although less than half the size of the ordinary switching engine.

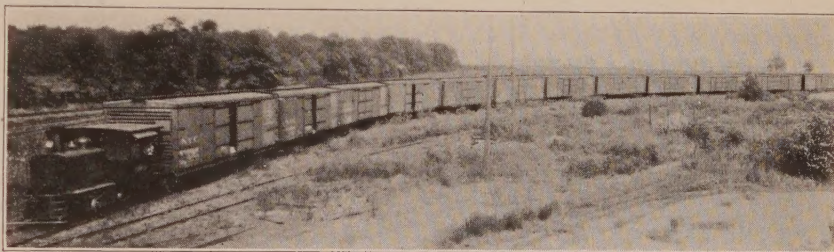
The locomotive weighs 25 tons, and in one recent tests in the yard pulled 22 twenty-two ton cars, or nearly twenty times its own weight. These cars were handled up a one-half of one per cent grade and around a curve.

The locomotive is equipped with a 180 H. P. 6 cylinder engine, and has four speeds both forward and back from four to ten miles per hour. The rear axle is driven by two heavy roller chains.

This installation has handled as many as 37 freight cars in one train, most of which were empty, but the total train load was estimated at 1,000 tons.

The average daily gasoline consumption is 17 gallons, and a half gallon of motor oil is put in the crank case every two weeks, while making a maximum of 74 and a minimum of 14 car shifts per day. A total of 1,078 cars were moved in 61 hours, the locomotive operating on an average fuel consumption of 3 1/10 gallons per hour.

Geo. Whitcomb & Co., Rochelle, Ill., are the manufacturers of Whitcomb engines.



New Milburn Gas-Cutting Torch

The cutting of heavy plates, risers, gates, billets, etc. with ordinary 4" water column pressure, ounces pressure or pounds pressure using either city gas, natural gas or by-product (coke oven) gas has been made possible by the development of the Milburn Oxy-Illuminating gas cutting torch, type LPG, a product of the Alexander Milburn Co., Baltimore, Md.

This torch can be used with by-product (coke oven) gas. It is not necessary to have the gas scrubbed; it can be used just as it comes from the coke ovens. A recent test with this particular by-product gas with a low B. t. u. content showed a speed averaging one foot per minute on three-inch plate using forty pounds oxygen pressure in conjunction with the gas at ordinary line pressure without being boosted. This cut as well as other metals that have been cut with this torch indicated the benefits that can be derived with the use of low B. t. u. content gases in metal cutting.

The cuts showed a sharp clean edge, devoid of slag on the underside of the cut, a narrow kerf and very smooth surfaces. A very important feature is the non-case hardening of the surfaces, which makes for easier machining, being able to maintain

the same speeds and feeds while performing the machining operations.

The high pressure cutting oxygen is controlled by a thumb valve which remains fixed in either open or closed position. The arrangement of the gas tubes gives the torch great transverse strength.

The torch is supplied with a range of tips to accommodate all thicknesses of metal. The tips are made of solid copper, designed to rapidly preheat the gases, giving better penetration and quicker cutting.

Tracyfier Exhibit at Power Show

At the recent Chicago Power Show the Andrews-Bradshaw Company Tracyfier exhibit consisted of an illuminated forty-two inch boiler drum in which air was blown upward to imitate the action of steam entering a boiler drum from the circulating tubes.

Inside the top of the drum, just below and connected to the steam nozzle, was a Tracyfier. It purified the air by removing water as it purifies steam. The clean dry air was ejected upward through the steam nozzle. The water removed from the air was carried through a drain pipe at the bottom of the Tracyfier and thence outside the drum.



With the Manufacturers



INDUSTRIAL LITERATURE

50th Anniversary

A 168-page jubilee catalog, in celebration of its fiftieth anniversary, has been published by the *Western Wheeled Scraper Company*, Aurora, Illinois. A brochure section deals with the history of the firm and the balance of the book is devoted to cataloging.

Lubrication

The lubrication of speed reducers is one of the subjects treated in the *Foote Brothers Gear and Machine Company Catalog* 206. Specifications and uses of hobs, pinions, gears and etc., are covered, followed by engineering information, data and tables.

Insulation Reprint

The *Celite Products Company*, Los Angeles, has reprinted in booklet form a lecture compiled by the firm entitled, "*High Temperature Insulation*."

There are 3500 words, treating such phases of the subject as the factors affecting the quantity of heat loss, heat conductivity through walls, and applications of high temperature insulation.

"Gypsum in 1925"

"Gypsum in 1925," published by the Department of Commerce, Bureau of Mines, gives complete statistics on gypsum production, imports and exports, and lists of manufacturers and miners. A small charge is made for the booklet by the Superintendent of Documents, Government Printing Office, Washington, D. C., from whom it may be secured.

Lock-Seam Pipe Catalog

The new *Naylor Spiral Lock-Seam Pipe* catalog is a profusely illustrated and practical booklet, issued by the *Naylor Spiral Pipe Company*, Chicago, Illinois. It will prove useful to those who require a light weight pipe with a smooth inside finish for conveying materials, liquid solutions, etc.

On Gyratory Crushers

The *Kennedy-Van Saun Manufacturing and Engineering Corporation* has assembled and published in booklet form a score or more commendatory letters from customers referring to the *Kennedy* gyratory crushers. These are belt driven or equipped with built-in synchronous motors for primary or secondary crushing.

Fire Brick

The *Ashland Fire Brick Company*, Ashland, Kentucky, scores disintegration of kiln linings, in an 8½x11 two-page folder, containing short but interesting text matter.

Jaw Crushers

Blake type jaw crushers are described by the *Traylor Engineering and Manufacturing Company* in Bulletin 2097, a recent publication. Specifications, sizes, workmanship, and setting dimensions are included.

Notes from the Field

International Combustion

International Combustion Engineering Corporation has purchased the capital stock of the Heine Boiler Company. This acquisition gives the International Combustion Engineering Corporation large boiler shop facilities at St. Louis, Mo., and Phoenixville, Penn.

The acquisition of the Heine Company will enable the International Combustion Engineering Corporation to furnish to its customers complete steam generating units fired with pulverized fuel or mechanical stokers, all of its own manufacture. Mr. C. R. D. Meier will remain as President of the Heine Boiler Company.

The International Combustion Building, 200 Madison Avenue, New York, New York, is now the address of the Heine Boiler Company.

Botfield Representatives

Frank J. Donnelly has joined the New York office of the *Botfield Refractories Company*, Philadelphia, Pennsylvania, and will cover the New Jersey territory under the direction of Chas. C. Phillips, New York district manager.

Foote Representatives

The *Interstate Machinery and Supply Co.*, 1006 Douglas Street, Omaha, Nebraska, have been appointed as representatives for IXL Products in Omaha, the eastern half of the state of Nebraska and the west portion of Iowa.

Nashville Machine and Supply Company, 123-125 Third Avenue, North, Nashville, Tennessee, have been appointed distributors for Nashville and the central part of the state of Tennessee.

"Hygrade" Reducers

The *Foote Bros. Gear & Machine Company's* new "Hygrade" worm gear speed reducers are described in Catalog 300, published by that firm. The several types of "Hygrade" reducers are well illustrated and described.

Testing Machine Development

"*Evolution of the Testing Machine*" is a pocket-size booklet published by the *Riehle Bros. Testing Machine Company*, Philadelphia, Pennsylvania. The contents include an interesting sketch of the changes and developments made in testing machines in the last half century.

Steel Representatives

Mr. E. S. Black has rejoined the *American Manganese Steel Company* with his headquarters at Chicago Heights, Illinois. His duties are those of consulting engineer, both mechanical and sales.

Mr. A. H. Exton has also rejoined the *Amsco* organization, in the capacity of chief engineer. Mr. Exton is an authority on the design and manufacture of manganese steel castings.

Alabama Office

Mr. W. H. Norton has been appointed manager of the newly opened branch sales office of the *Link-Belt Company*, at 229 Brown-Marx Building, Birmingham, Alabama. Mr. Norton was for many years connected with the Chicago sales department, and will be assisted by Harold R. Haught.

Engineering Expansion

The *Lund Engineering Company*, Little Rock, Arkansas, is the successor of *Alfred M. Lund, Civil Engineer*. The officers are as follows: Alfred M. Lund, president; Geo. E. Garanfio, vice president; C. Ben Hoech, field engineer and Frances Bowers, secretary and treasurer.

Crusher Representative

John A. Plimpton has been appointed western manager of the *Pennsylvania Crusher Company*, with offices at 232 South Clark Street, Chicago. He has for some time been sales engineer in the Pittsburgh office.

Mr. Plimpton succeeds Mr. C. S. Darling, who has taken up association work.